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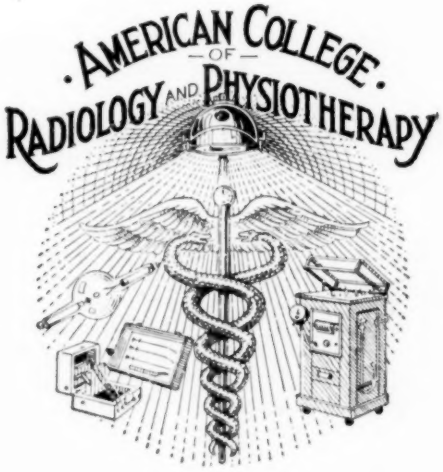

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Physiotherapy Treatment of X-Ray Burns*

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OMAHA

WHILE the title of this paper presupposes the discussion of the treatment of x-ray burns, a brief discussion of the different types or degrees of burns will be first taken up.

The usual classification given to x-ray burns is the same as that generally given to burns of thermic origin, namely, first, second, third and fourth degree. A first degree burn is a reaction sufficient to produce an erythema within three to ten days, which subsides and completely disappears a few days later with epilation in about three weeks. A second degree burn makes its appearance in about the same length of time as first degree burn but the erythema lasts longer and is followed by epilation, a desquamation of the superficial epithelium in three to four weeks and later bronzing and pigmentation of the skin. The first and the second degree reactions are accompanied by little or no subjective symptoms. Third degree reactions manifest themselves in about the same length of time but are characterized by a more intense erythema, burning pain, formation of blisters in ten days to three weeks and later epidermal necrosis. Fourth degree reactions have all the former characteristics, and in addition, necrosis and sloughing of the underlying structures as subcutaneous tissue, fascia and muscle.

This foregoing classification of reactions is about what is observed when over exposure to the unfiltered ray occurs but these reactions are markedly modified by the interposition of different amounts of filter. With the higher voltage and heavier filter now used, it is possible to get the marked bronzing of the skin with superficial desquamation in four to eight weeks with but little or no erythema preceding.

The so-called erythema dose varies in different individuals as much as 20 per cent and the resistance of the skin and tissues on different parts of the body of the same individual will vary nearly as much.

The dorsum of the hand, anterior surface of the leg, the pinnae of the ear and the skin over the sternum will not tolerate in safety as large a dose as other areas of the body.

From the standpoint of treatment, Sampson, in a recent edition, very aptly classes all x-ray burns as acute and chronic. Those characterized by an open ulcer, shading off through an erythematous border to apparently healthy skin, are classed as "acute." Those of the more diffuse type, characterized by skin atrophy, small discrete ulcers, keratoses, etc., as "chronic."

Experience has taught that healed x-ray burn does not always mean a cured x-ray burn and surgeons in time past have attempted cures by complete excision of the ulcer and the atrophic, fibrosed tissue, supplemented by some sort of plastic operation to fill in the resulting defect. Success in these cases has been varied and on the whole, far from satisfactory, due to the fact that this procedure necessitates the sacrifice of a large amount of tissue, and the base upon which tissue is to be grafted is already in a semi-fibrosed state, with barely sufficient blood supply to nourish itself, much less the overlying flaps.

The successful treatment of either class of cases necessitates a thorough appreciation of the underlying pathology—the cause of the so-called "burn." The biologic action of x-rays is primarily upon the nucleii of the individual cells of the tissues exposed. A change is first noted in the chromatin of the nucleus which gradually extends causing disintegration of the nucleus resulting in dissolution and death of the cell. This change, while not confined thereto, is particularly evident in the endothelial lining of the arterioles and capillaries. Dead tissue cells, no matter from what cause, are always replaced by connective tissue. We therefore have an endarteritis obliterans due to the change in the endothelial coat of the arterioles and capillaries. The superficial tissues deprived of their blood supply and nourishment die a death in keeping with the cause, just as in an endarteritis from whatever etiology in any part of the body, whether it be from syphilis, atheroma or from frost bite. The latter lesions are usually confined to the extremities, while the former one occurs at site of exposure to radiation. The consequent fibrosis as the result of cell destruction due to radiation, will depend upon the amount of radiation received. The surface, or skin intensity of the dose will vary with the voltage and the amount of filter employed, likewise, to a lesser extent, with the target skin distance and the individual susceptibility of the patient. Granting that a lethal or destructive dose has been delivered, the greatest destructive effect is upon the skin. This gradually becomes less and less as more tissue is penetrated. In other words the endarteritis and fibrosis become less, therefore less tissue will die and slough out deeper down, than on the surface.

If the skin is completely destroyed, the subcutaneous fat and superficial fascia will probably slough also. If a larger dose has been given the deep fascia with its ramifications between layers of muscles will be next to break down. The muscle tissue due to its much better blood supply is able to withstand a

*Read at the Annual Meeting of the American College of Radiology and Physiotherapy, Omaha, Sept., 19, 1923.

larger dose without dissolution than are these preceding structures.

When disintegration and sloughing have begun they will continue until a point is reached where there is sufficient blood supply to maintain life in the tissues. Even beyond this point, there is much fibrosis and the tissues are badly crippled. We know that the fibrous or scar tissue that has penetrated these tissues below the surface of the ulcer continues to contract for some time, this accounts for many cases breaking down after having healed. With this condition existing, we recognize the futility of attempting a plastic operation or of grafting flaps upon tissue that has scarcely sufficient blood supply for its own vitality.

With this underlying pathology in mind, a rational procedure in the way of treatment is the breaking up of the underlying fibrosis and the restoration of the circulation, without which no case can be said to be cured. In doing this we have effectively employed convective heat through the 1500 watt incandescent lamp, the actinic ray, diathermy, x-ray and massage.

Under the following treatment a case of an extensive ulcer causing intense pain, was made comfortable without opiates and progressed quite satisfactorily: The incandescent light was used for its heat effect which dilates the blood vessels and capillaries, and assists markedly in relieving the pain. In the beginning it was applied daily for twenty to thirty minutes. The actinic ray (air cooled), was used to maintain a prolonged or almost continuous hyperemia of the surrounding skin for several inches outside the ulcer. Daily treatments of short exposures of one-half to one minute's duration were given the edges of the ulcer to promote granulation and dermatization. Moderate exposures of three to four minutes daily were given the ulcer, with edges shielded to protect granulation. Twice a week a heavy dose of seven to ten minutes was given the body of the ulcer which kept it sterile and controlled the odor. After healing was fairly well established, massage and manipulation of surrounding tissue was given daily. Later daily administration of diathermy through the underlying tissue was followed by massage, supplemented with fractional doses of x-ray to assist in the absorption of the fibrous tissue.

Case History: J. L., age 51, farmer. Received an over exposure of x-rays during the first part of April, 1922. In about two weeks, small blisters appeared over the circular area in lumbar region. Within the following week an area said to be as large as the hand became raw.

After two to three months this healed except a small spot the size of a nail head which was always scabbed. This became sore during the latter part of October while the patient was husking corn. The first part of November the adjacent tissues began to break down and this process continued steadily to the present time, Dec. 21, 1922. The patient now has a circular area in the mid-lumbar region nearly eight inches in diameter. This area has necrosed and is sloughing and is covered by a thick seropurulent discharge, the result of necrosis. It is surrounded by a ring of intense erythema, about two inches wide. The skin in this ring is markedly indurated and thickened, and the epidermis is loosened. The edges of the ulcer are regular and surrounded by numerous small vesicles of varying size. The odor from the necrotic area permeates the whole floor in that wing of the hospital. The patient says that the pain has been severe for more than three weeks and for the past ten days he has been unable to sleep on account of pain.

The above consultation was held about 6:30 in the evening. He was given thirty minutes of radiant light followed by five minutes of air cooled actinic ray at thirty inches distance. He said next morning that he had rested better than he had for ten nights and he had not required an opiate. The treatment was then continued as outlined in the paper. The first picture was taken some two weeks after treatment was instituted; the second one some three weeks later; showing the depth to which the facia sloughed; the third about five weeks later, showing still deeper sloughing of fascia, but edges are healing. He left the hospital after 26 weeks with an area of about three square inches that had granulated full, but was not dermatized. I saw him some three weeks ago and this area is about half healed over.

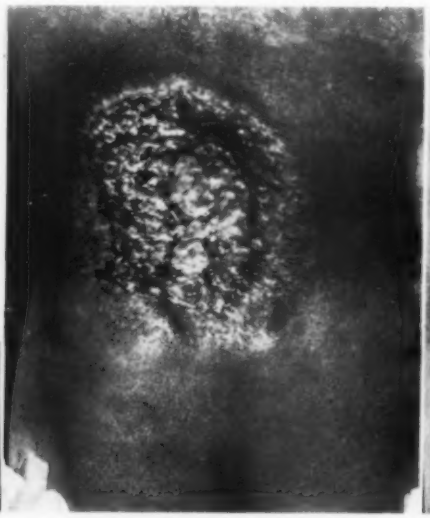

Fig. 1—Photo two weeks after beginning treatment with quartz lamp and radiant heat. Note the new skin at the margin of the ulcer.

Fig. 2—Photo six week after beginning treatment. Note new skin at margin of ulcer. Ulcer greatly reduced in size.

Fig. 3—Photo twenty weeks after treatment. Ulcer much reduced in size. Incision at lower margin in order to expose sloughing fascia.

SUMMARY

1. An x-ray burn is the necrosis and sloughing of tissue as the result of underlying fibrosis and endarteritis produced by over exposure to radiation.
2. X-ray burns are amenable to treatment.
3. Rational treatment should be directed to the relief of fibrosis and restoration of circulation.
4. Physiotherapy is the rational treatment for acute x-ray burns.

The Surgical Treatment of X-Ray Burns*

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TO ANYONE who has observed a severe case of an x-ray burn with its intractable behavior and accompanying distress and pain and its reputed tendency to degenerate into malignancy there can scarcely be any doubt about the need of some procedure, even if that be a surgical one, to bring about a "cure." In this discourse a measure is offered in the complete excision of the burned area and the application of Ollier-Thiersch skin grafts. But the uninitiated will reply that "such a procedure is too radical and is not justified." With the experience here presented, however, covering a period of ten years and the histories of eighteen cases little contravention can be offered against it. The condition which favors opposition to this radical procedure is the fact that the skin is not entirely destroyed and the idea that, under conservative measures, it will restore itself in time. The story of these eighteen cases, however, proves that this is a vain hope and much anguish has been experienced by the victims over long periods of time (in one case seventeen years and most of them several years), not to mention the expense engendered through the purchase of costly modern emollients and the waste of time given to the treatment of these lesions by some of the newer light rays. A consideration of the pathology of these conditions reveals why they behave as they do and why the likelihood of spontaneous restoration of them to the normal is impossible. Described by Bloodgood, in the x-ray ulcer there is keratosis at the edge with a typical downward growth of epithelium with or without pearly body formation, a superficial zone of cellular granulation tissue; unusual scar tissue formation which as a rule extends to muscle; thickening of the walls of the blood vessels with endothelial obliteration and minute abscess formation beneath the surface of the ulcer. In the study of our own cases we have found much the same condition, of course with variation. The chief offending change unquestionably is the obliteration of the blood vessels.

The gross appearance of these burns presents all the stages of tissue change from slight telangiectasis to severe and deep ulceration. One peculiarity observed in some of them is a dry tanning of the area giving the appearance of a drum head. The area does not slough en bloc quickly but remains attached to the contigious tissues half alive, half dead, of parchment-like appearance with very little inflammatory reaction, the patient always retaining the expectation that it will take care of itself. The more common form is the eczema like aspect with its scattered patches of keratosis and its unending healing and breaking down and the accompanying stinging, itching and burning, but for all of these conditions the method of excision is unhesitatingly advocated with the supplemental skin grafting except in the cases of telangiectasis where, of course, only cosmetic aim would direct its use and it might be questionable. In the series of eighteen cases reported almost every part of the body has been invaded. The hands and fingers, the cheeks, the nose, neck and shoulders, the abdomen in the pelvic region, the groin, and once the nates up to margin of the anus following the application of the rays for pruritis ani.

The behavior of these grafts as compared with skin grafting for other conditions presents some distinguishing features. In the applied grafts in cases of skin destruction from fire, escharotics, or traumatism one is accustomed to have the grafts take en masse within four days. In the lighter forms of x-ray destruction this too is many times the sequential experience but there are burns of immeasurable depth in which the grafts primarily adhere; but at the first dressing, the third or fourth day, they do not present through them the pink flush or real vitality characteristic of a good "take." On the contrary they are

*Read at the Annual Meeting of the American College of Radiology and Physiotherapy, Omaha, Sept. 19, 1923.

Fig. 1—X-ray burn of nine years' duration. Patient had been treated for reported sarcoma. Burned area was partially excised and Thiersch skin grafts applied. (Research Hospital, 1913.)

Fig. 2—Result of case in Figure 1, seven months later. Ulcerative processes have remained healed, but a wider excision would have been advisable.

Fig. 3—Roentgen burn resulting from treatment for eczema. Duration, seven years. Was excised to the tendons and three Thiersch grafts applied.

Fig. 4—Result of case in Figure 3, two years later, fingers in extension. Three years later a slight eczema appeared in the grafted area without breaking down of the skin.
Fig 5—Same as Figure 4, fingers in complete flexion.

swollen, thickened and in color are oyster-like in appearance and there is also at this time the odor of decay. The grafts are still adherent but eventually they give way to an apparent complete slough, although that is not always the fact.

In the ordinary forms of skin grafting we have experienced the lighter exhibition of superficial desquamation of the grafts which is observed at the second or third dressing, leaving perfect unbroken skin beneath. It is possible that the apparent sloughing of the oyster-like formation is the analogue of this desquamation for as a rule we immediately find multiple masses of skin development appearing in its place with rapid coalescence, progressing to complete epithelization and permanent cure. Undoubtedly the difference in the behavior of these grafted areas depends upon the depth to which the destructive influence has permeated or rather the obliteration of the blood vessels, whose intergrity is so essential to the nourishment of the grafts and their propagation.

If there were some way by which we could measure this depth by gross inspection we could always be sure of rapid success, but as it is a microscopic matter we can only let experience be our guide. Invariably the complete skin is sacrificed and the excision should go to the limit of the burn and beyond. If there is a subdermal adipose tissue of healthy appearance the grafts are applied on that but as fat is normally poor in blood supply it is not well to attempt it if there is a doubt. The next structure we are likely to encounter is fascia which because of its nonvascular character is particularly susceptible to the tanning influence of the ray and forbids any attempt at grafting, group 3, example of diversified taking, although even in a case of x-ray burn, we have grafted directly over the tendons of the hand with complete success (group 2). Nevertheless fascia is always sacrificed wherever possible. In sequence the next structure to be encountered is muscular tissue and because of its rich blood supply the best success is likely to follow here, although paradoxically the nearest approach to failure in one case was experienced on just such tissue; which goes far to prove the value of destructive depth determination and the frailty, sometimes of gross inspection; even bone has been found unable, at times, to resist the devitalizing influence of the ray; a case is now under treatment by us which three months ago presented a limited area of dry tanning of soft tissues of the cheek, following a treatment for malignancy as well as a dead exposed area of the malar bone. The soft tissues have cleared and are granulating; the bone, it is almost certain, can be prepared either by decortication or the natural process of sequesterization down to the cancellous tissue and made receptive for a successful graft.

In substantiation of the foregoing statements a review of case experi-

Fig. 6—Roentgen burn resulting from one exposure in the treatment for small papillomata of the neck. Only the ulcerated portion was excised by an elliptical incision across the neck, and immediate grafting. The outlying areas were presumed to be sound.
Fig. 7—Conditions of same case as Figure 6, seven months later. The grafted area healed but a new area of ulceration appeared in the right ungrafted area. This was completely excised and grafted, and resulted in prompt healing.
Fig. 8—Same case as Figure 7, ten months later. The area has soundly healed, but has not yet assumed its natural elasticity.

ence and results is well indicated. In 1913 (group 1), the first effort was made in the case of burn acquired in the neck by treatment for the alleged cure of a "sarcoma." As at that time it was widely questioned whether grafting would succeed on such a base, only a limited portion in the center showing the greatest destruction was excised down to muscular tissue. The result was completely successful although the desirability of a wider removal was thus early demonstrated: however, in the ten years since, there has been no further breaking down of the skin. Twice the burns were the sequence of treatment for carcinoma, in one case of the nose, and the other in the posterior triangle of the neck for recurrent lymph nodes after the excision of a carcinomatous breast. The first healed primarily and quickly; the second was delayed but eventually in the course of five weeks was complete in its restoration; both cases had remained healed five years after the operation. In fourteen of the eighteen cases treated by this method the healing was complete en masse primarily. In four of them it was only part mass formation "taking," the portions in which it did not so take depending upon the slower epithelization from islands of skin appearing after apparent slough. In the case already referred to as the nearest approach to failure, a case following upon x-ray exposure for a "cure" of a sarcoma in the groin above and below Pouparts ligament, only the portion below was excised and the area completely covered by three grafts taken from the patient's own body, but these did not take to any extent whatever. The wound was then allowed to granulate and regrafted with homologous grafting. This only resulted in the appearance of island skin from which healing finally took place, but at this time ulceration of the unexcised portion above Poupart's ligament had occurred. With only partial success attained from the previous grafting, resort was made to exposure to the actinic ray over a period of four weeks with even more doubtful efficacy.

A third attempt at grafting was then made this time using the skin of a brother as a test, as we thought perhaps the fault of previous efforts lay in the texture of the patient's own integument; but here again only island formation followed, eventually healing by a slow process of epithelization. This experience rather emphasizes the importance of depth destruction determination. With the presentation of these experiences and these cases it seems safe to assert that surgery plays a very important part in the treatment of such lesions.

Discussion.

Dr. Tyler: I have enjoyed hearing both of these papers this afternoon. It is a subject which interests all of us. Under the present day employment of x-ray for diagnostic and therapeutic purposes, we are seeing more burns of the skin than we have ever seen before, due to the fact that there is a wider employments of the x-ray. A careful study of the pathology underlying these burns is of value to all of us. We have seen a large number of them. We have treated them both by physiotherapeutic methods and by surgical methods. Both have their place. I think, however, that in a large majority of cases physiotherapeutic methods will result in a permanent healing of the wound with a soft scar and a good circulation. In very deep cases where the fascia is sloughing, of course that fascia must be trimmed off, and any minor surgical procedures which will save time for the patient should be employed, even though we are continuing with the physiotherapeutic treatment. We can practically be assured in every case that within twenty-four to forty-eight hours after the application of physiotherapeutic methods, the patient will have no more pain. If we could not do more than that for the patient, the use of physiotherapy in the treatment of these burns would be justified. Where we use the ultraviolet ray as given from the quartz burner, and what Dr. Fouts has styled the actinic ray, we can render these wounds sterile in one or two applications. As soon as the infection has subsided, the pain stops, so that we think the infection must have a good deal to do with the intense pain which these patients suffer. At any rate, we know that the subsiding of the infection and the cessation of pain coincide.

Drs. Bevin, Blair and others using surgery exclusively in treating these burns have advocated the theory that the pressure of the fibrous tissue on the terminal nerve filaments was possible for the intense pain which these patients suffer. That may have some bearing, but I do not think it is the whole answer. I have photographs which I could have shown but did not bring over, of patients with very deep ulcerations following the application of x-ray, some of them having been in existence for a year and a half, with constant pain and inability to sleep, who were able to rest in perfect comfort after two exposures to the actinic ray.

As soon as the infection has subsided, granulations grow into the wound, and as soon as it fills up level, epidermization rapidly takes place. If we think we can save time at this point, we have the surgeon put on a skin graft in order to shorten the period of hospitalization.

Dr. Cutler: I certainly think we have given to us today some mile posts which we want to observe carefully. If there is anything that will give a man the blues and destroy his enthusiasm both with the violet and x-ray, it is to run up against one of these accidental cases.

I judge the doctor will tell us with reference to these burns, especially as to radium, that the history in these cases is carelessness. I venture

Fig. 9—Roentgen burn of the lumbar region, resulting five months after a diagnostic exposure. The complete area was excised to a depth of three-fourths of an inch, including skin fat and much fascia. The entire area was grafted from the host's own thighs.

Fig. 10—Result three months after grafting. Although still rough the area has completely healed except the small dark area below the X. Slowly sloughing fascia delayed this healing, but two months later it was reported healed with entire absence of pain and burning. Patient has been out of the hospital since this photograph was taken.

to say every one of the cases he reports came because of carelessness on the part of the operator.

I noticed this device in the hospital I visited this morning: It was new to me and made an impression on my mind so that I shall use it when I get home. After the copper or aluminum filters are put in, there is a piece of tape that runs around and fastens them in. If this tape is hanging down, one knows that the patient is not protected. The tape is a sign and reminder.

With reference to the violet rays, we need not be afraid so far as general effect goes. You will cause your patient a lot of trouble and may have some unkind things said resulting from violet ray treatment. But the beauty of it is it will do the patient no harm. It is an old-fashioned sunburn. On the other hand, the x-ray burn will be something to cause much regret.

Dr. Blair, (closing): In presenting the surgical aspect of this matter, it is not intended to create any controversy. You have had the two procedures presented, and I think very ably from the standpoint of the actinic ray. Naturally if these burns can be handled in so conservative a manner, those who are guilty of the creation of these lesions should be very welcome to give that procedure, a first trial. I simply show the surgical accomplishment as has been my experience in case there is no other measure by which these lesions can be cured. The experience of the cases which I have handled is given from the surgeon's viewpoint.

It is true, as the Doctor said, many are due to carelessness, some to lack of understanding and some to pure ignorance. But the cases which I presented have many of them been subjected to the actinic ray or these newer rays—I think the term "actinic" covers the whole group of rays used in the cure of these cases. If it does not cure, certainly skin grafting will in all these cases, even excepting the possible doubt about the one case. Certainly the excision and the skin grafting were of marked benefit in that case.

Dr. Ashton's point of grafting on a base already destroyed has some merit. The knowledge of how deep the burn has taken place and the structure to which you are applying your grafts, comes purely from experience. It naturally occurs to one in the case of this severe back burn which I exhibited that the pedunculated flap might be turned into such an area and the lesion healed in that way, rather than grafting an area on the burn, which would be unquestionably successful. But here the same question arises that does in the case of the application of the Ollier-Thiersch's graft: Will the base stand the graft of skin? I can only say the highest proof of the efficacy of surgical procedure in these cases I report is that none of them has subsequently broken down.

Dr. Fouts, (closing): As long as we mortals remain fallible, we are going to have x-ray burns, because we will make mistakes one way or another. We will forget to put in the filter or something else will happen. As long as radium and x-rays are used, we will see x-ray burns.

I do not mean to infer the treatment here is the treatment for every burn. I think perhaps there are burns so deep that you will have to skin graft, as Dr. Tyler said, and undoubtedly augment the healing when the granulations get to the point where skin grafting can be used.

The main point I want to make is this: The burn can not be said to be cured until you have re-established circulation. With the surgical procedure the Doctor goes into, he cuts down to where there is a new blood supply so that it will not again break down. Then he has every reason to expect success.

Why sacrifice tissue when you can re-establish circulation and conserve it, and at the same time make the patient comfortable, and as quickly, without the necessity of surgical intervention?

I have enjoyed the Doctor's paper and the discussion very much. I thank you.

Interpretation of Shadow Alterations*

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THE changes which are to be found in tissues of the dental area can be recognized comparatively early. That is to say that a destructive process or an alteration of tissue density does not have to reach such proportion that a roentgenogram is used in confirmation of a diagnosis. The dental roentgenogram is easily used as a means of diagnosis.

There are several reasons for its use in this connection, all of which are based on the one fact, to-wit, the interpretation of shadow alterations. One of the greatest fields of error in this conection is the looking for large areas of alteration or distinctly outlined changes. When such changes can be pictured, a diagnosis is often possible without the picture. The greatest value in dental roentgenography is in the early recognition of changes, the interpretation of their value, and the directing of treatment or surgery for the termination of them or the prevention of their extension.

It is obvious that the changes to be sought therefore are minute in character. It is therefore paramount that those who attempt dental roentgenographic diagnosis must be conversant with the appearance of the normal. Such knowledge must be coupled with knowledge of the effect various pathological conditions may exert on penetrability of tissue, and in turn, in what grade of shadow to look for such alteration. As Grade II shadow is the most important in picturing, one must be appreciative of the appearance the mal-position of portions of tooth substance may make, also changes from loss of alveolar tissue. This means a close study of tissues of Grade II-a and Grade II-b of roentgenographic appearance. It means also the knowledge of what pathological processes are peculiar to these grades of shadow and how such pathology effets them. Further, that is to say, by the increase or decrease of their density and resistance to penetrability.

Let us now consider what the normal appearance would be of a tooth normally placed in a normal alveolar process. The tooth is composed of dense matter of bone of equal resistance. Through the root portion of the tooth there is a canal which runs parallel with its long axis. The opening of the root canal is usually found at the root apex and at its other end it opens into a large

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recess known as the pulp chamber. The pulp chamber varies in size and shape in the different teeth and is characteristic in shape. The root canal and pulp chamber contain the nerve and blood supply to the tooth. These contents are of soft tissue resistance and when pictured show no structural formation or arrangement of characteristic appearance as the combination of soft tissue and bone shadow which goes to make up Grade II-a shadow of the alveolar type. It is distinctly a shadow of Grade I type surrounded by a definite and characteristic amount of bone, or Grade II-b type. The entire area of Grade I shadow, however, is characteristic in shape and proportion. In the normal there is also a distinctive appearance to the intensity of the shadow, and its sharp outline. Under pathological conditions differences in this sharpness have an interpretive value.

An intimate study of tooth socket construction reveals that the socket is walled off from the contiguous alveolar process by a slightly denser bone edge or plate. This plate has been given the name of lamina dura. Roentgenographically it will be noted that as the Grade II-a shadow of alveolar tissue approaches the tooth bed, there is a sudden thickening of the shadow by a loss of the Grade I content. The impression is given that the bone is more dense. This is truly so. However, it has not quite the compactness of dense bone, yet heavier than alveolar bone generally is. This alteration of the appearance, denoting the socket wall formation often persists long after tooth extraction, so that it is not a pictured or phantom thickening, but a real one.

Interposed between the socket in the alveolar bone and the tooth itself, is the peridental membrane. This structure is soft tissue with low resistance to light wave penetration and therefore is pictured in Grade I shadow. The peridental membrane is usually of equal thickness throughout and lines the entire socket. Roentgenographically, therefore, there is an evenly thick line of Grade I (soft tissue shadow), which is to be found between the tooth, as represented in Grade II-b shadow and the alveolar process and tooth socket as represented in Grade II-a shadow.

Let us consider the pathology to be found associated with various conditions.

Pathology as pictured roentgenographically can be divided into acute and chronic. In an acute condition involving a tooth, the changes which can be first pictured are to be noted in soft tissue. Therefore Grade I shadow must be studied. Soft tissue is pictured in the root canal and pulp chamber of the teeth and as the peridental membrane surrounding it. The constancy of shape, size and contour of the root canal and pulp chamber are characteristic. The evenness of the appearance of the peridental membrane marks its normal condition.

Granting that the circulation of the blood to the tooth is interfered with, there is an alteration in the resistance to light penetration in the pulp chamber and root canal. The first change to be noted is an increase in the distinctive Grade I shadow, so that the line of demarcation outlining the limits of the canal and pulp chamber are sharper and cleaner cut. Should the pulp become putrid and gas formation cause an apical irritation, there is a further increase in the amount of Grade I shadow and a decrease in resistance, this time at the expense of the tooth socket wall. There is a corresponding loss in Grade II-a shadow at the point at which Grade I shadow has increased. It can be noted that what should have been an evenly thick line, representing peridental membrane, has become irregular and thickened, particularly periapically.

It is not to be construed that the only point where destruction takes place in the condition of putrid pulp is in the thickened peridental membrane, for the peridental membrane may become thickened at any point and may even permit of gas and debris discharge onto the gingival surface. The thickening that may be noted is over an entire root surface or any portion of it. A putrid pulp may drain or the condition be absorbed in a process of nonsurgical obliteration. In these instances a precipitation of mineral salts usually takes place. This change can be pictured and is noted in a decrease in root canal shadow outline, and the tendency to obliteration of the lines marking the canal and pulp chamber walls.

Fig. 1

There is often room for error over this point. In the older patients there is a senile condition of the pulp contents of a tooth, which tends to obliterate it. In such cases the apical end is more often the first to show obliteration, while in putrid conditions the apical end remains open to the last. In the latter condition there is also the corresponding thickening of the peridental membrane to be noted in contradistinction to a normal appearance in the senile condition.

In studying the normal positions in which Grade I shadow is found and its relation to normal, we find that in the area of the molar teeth of the upper jaw, the site of the maxillary sinus is pictured in shadow of the type of Grade I, well outlined in bone type shadow of Grade II-b. At times the extent of the antrum is not clearly defined by demarcation of shadow of Grade II-b type but seems to terminate more gradually by fading into shadow of Grade II-a. In the latter instances cystic conditions must be differentiated. The normal position for the antrum is one of the points to be considered in diagnosis. The reason for the lack of appearance of any apparent antrum wall was given in a previous paper, but it will bear repeating.

When a hollow object is pictured, only the limiting walls which are penetrated through their greatest thickness, cause sufficient resistance to register. This is illustrated in the accompanying picture (Fig.1), which is the registration of penetration through a string of coated wax beads. Your careful study of this illustration is asked and your attention directed to the rather sharp and well-defined outer outline of each bead and the rather gradual shading out of the inner outline. The effect of compounding the shadow outlines is shown where the beads cross one another.

In the line drawing there will be found the explanation for this appearance in the description of penetration through a hollow cylinder. (Fig. 2.)

Grade I shadow is again of interest in the study of pyorrhea alveolaris, where it will be found replacing alveolar shadow, about the tooth. In this condition it will be found that about the gingival margin of the tooth there will be an apparent broadening of the line of Grade I shadow representing the peridental

membrane. The line will be found thicker at this point and a loss of alveolar shadow (Grade II-a) will be noted to correspond with the increase in Grade I (soft tissue) shadow.

A close study of roentgenograms of the condition of pyorrhea will disclose the fact that the increase in Grade I shadow in pyorrhea always will be found to connect with the shadow of soft tissue about the tooth neck or gingival surface. This is in contra-distinction to localized inflammation or abscess of the peridental membrane. In the latter instance there will not be found any connection with the two processes, that is, abscess and the gingival surface.

Grade I shadow further replaces Grade II-a shadow in all abscess formation. In the acute, there is no defined wall, and the increase in the amount of Grade I shadow is not marked or defined. In the chronic process, there is most often a well-circumscribed area walled in by denser tissue shadow of Grade II-b.

Processes may be differentiated as acutely toxic where the circumscribing heavy bone plate (Grade II-b) shadow, is irregular and apparently missing at one point. A process from which active absorption is taking place rarely is well circumscribed. Such a process is one which most often will be found responsible for a patient's toxic symptoms.

There are but few areas where a small abscess process which is circumscribed must be differentiated from some anatomically similar (that is to roentgenographic picturing) densities. These are chiefly about the mental foramen and inferior dental canal, in the lower jaw and about the incisor space in the upper jaw. Frequently some of the bone cells about the angle of the lower jaw are of such size and close proximity to the apex of the teeth as to be confusing in appearance. In these latter instances the peridental membrane shadow and the accompanying shadow of the lamina dura or tooth socket wall can be traced as projecting into these areas and protecting the tooth apex.

In older children and in young adults in whom the teeth pictured have not fully formed, particularly at the apex, there will be found an enlargement of the periapical shadow of Grade I. In such instances the differentiation of abscess must be made. Firstly, these teeth are found vital, without fillings or cavities; secondly, the age of the patient, with clinical history, and thirdly, the general appearance of the neighboring teeth, all tend to help to make a diagnosis.

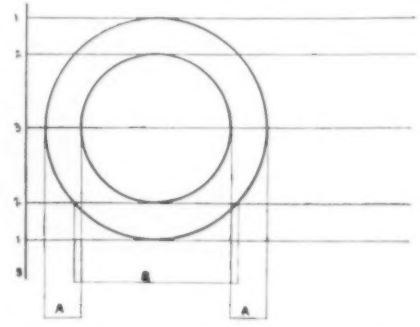

Fig. 2—The vertical line S at the left of this illustration represents a screen or film. The two circles, the outer and innner boundaries of a tube, so that the area between them would be the tube wall or substance. The horizontal lines represent individual penetrating rays of light. Lines marked 1 show the extreme limits of the object while lines 2 traverse the mass at the boundary of the tube lumen. Line 3 is directly through the middle. To determine the resistance at these various levels, that portion of lines 3 and 2 which travels through substance is indicated as A and B. The greatest resistance will be noted is at 2 which is a tangent to the inner circle. This is illustrated and determined from the fact that line B (the length of resistance encountered by line 2), is greater than the combined length of A and A (the length of total resistance through the level of 3).

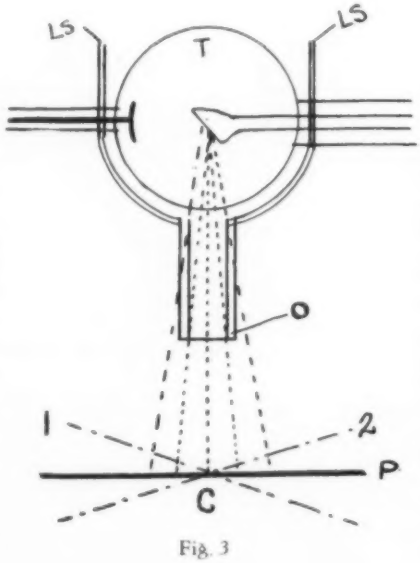

Fig. 3

Frequently a tooth which has not fully formed develops a putrid pulp, from trauma or decay, and its growth ceases. To differentiate a case of this nature with abscess formation from abscess formation with root absorption is at times difficult. Here the history and observation of the neighboring conditions is of importance.

Cysts of every variety are denoted by a loss of bone shadow and its replacement with more or less of Grade I or soft tissue shadow. The distinctness of this pictured replacement is dependent on a number of circumstances. The cystic process may be large, yet shallow in the linguo-buccal direction. It may involve the space of the antrum, or it may not be situated in the bony process of the jaws. Any of the foregoing situations will cause a lack of detail in the picturing of the cyst. However, a careful study of the amount of alveolar (Grade II-a) shadow and the existing proportion of soft tissue (Grade I) shadow in its composition will disclose a variation, sufficient to make a diagnosis.

Conversely, the study of Grade I shadow about the antrum shows an increase in density and resistance as compared with its study in bone. In any infection of this sinus, and its filling with pus or serum, the resistance to penetration through the whole mass is increased so that a shadow is formed which may even approach Grade II-b in density and resistance. Care must therefore be taken in considering Grade I shadow. One must remember the anatomical position and significance of such position before making an interpretation. The greatest field for the study of Grade I shadow is in replacing the shadow of normal bone and decreasing bone resistance. In a space like the antrum, an increase of soft tissue tends to increase the resistance and show a shadow of grade rather than lesser density, yet this shadow has all the characteristics of Grade I shadow.

Unfiltered and Filtered X-Ray Dosage*

By ALBERT BACHEM, Ph. D.

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THE proper dosage in superficial as well as in deep therapy is still in an unsatisfactory stage. While the tendency generally prevails to apply low and safe doses, and while most of the radiologists avoid heavy doses, x-ray burns occur frequently.

The object of this study is to discuss the errors which lead to wrong dosage, from a physical standpoint. For this purpose I have measured a large number of superficial and deep therapy transformers and have studied the methods of treatment customary in the States.

Superficial doses are usually not measured, they are estimated. This means, the output of a tube is determined from the factors which produce the radiation. These factors are kilovoltage, milliamperage, filtration, focus skin distance, and time. This method is known as the indirect method of determining x-ray dosage.

For superficial treatment the majority of radiologists use the formulas of Witherbee and Remer. The formulas which these authors developed enable one to estimate the dose applied, depending on the kilovoltage, milliamperage, filtration, focus skin distance, and treatment time; and further according to the calculated dose the treatment time can be estimated which produces a certain biological effect.

For unfiltered technique the standard formula of Witherbee and Remer is as follows:

$$\frac{3\ (\text{in. spark gap}) \times 3\ (\text{ma.}) \times 4\ (\text{min.})}{8\ (\text{inch distance})^2} = \frac{36}{64}$$

The $\frac{36}{64}$ represent the so-called skin unit dose. This formula, according to the authors, may be used under all conditions for the determination of the dosage, up to 9 inch spark gap and to 20 inch FSD. The product of the voltage, the milliamperage, the treatment time, divided by the square of the distance, is the dose. If this product is $\frac{36}{64}$, a skin unit dose is applied; if it amounts to $\frac{45}{64}$, an erythema dose is produced; if it amounts to higher or lower values then stronger and milder doses are applied.

Physical and biological investigations of the author as well as other scientists have shown that the intensity of the produced x-radiation does not increase in ratio to the spark gap. The intensity judged by the biological reaction, practically increases in ratio with the square of the spark gap. Hence if we apply the Witherbee and Remer formula for a varying kilovoltage, we will commit an error. For instance, if we increase the spark gap from 3 to 6 inches, then according to the mentioned formula, we would double the intensity of the radiation. In reality it increases the intensity nearly in the ratio of 1 to 4. According to Witherbee and Remer the treatment time should be shortened in the ratio 2 to 1; however, based on our investigation it must be decreased in about the ratio 4 to 1.

For filtered dosage, Witherbee and Remer give a formula which contains the focus skin distance in the first power, while from geometrical and physical standpoints it should contain the square of it. Also biologically the test has been made, that the so-called square law of distance holds exactly true. For instance, Henry Schmitz worked out his treatment time for the following factors: 130 kv. 5 ma. 1/2 Cu, the focus skin distance varied from 35 to 80 cm. The following periods of time produce exactly the same biological reaction:

60 min. with 35 cm. focus skin distance.

120 min. with 50 cm. focus skin distance.

210 min. with 65 cm. focus skin distance.

320 min. with 80 cm. focus skin distance.

The treatment time increases exactly with the square of the distance. This proves that the law of distance holds exactly true for filtered radiation.

The omission of the second power of distance in Witherbee's and Remer's formula will lead to severe errors in dosage, when the focus skin distance is changed. Let us suppose, for instance, that with 10 inches focus skin distance and certain other conditions the erythema time is five minutes. For 8 inches focus skin distance according to Witherbee and Remer the treatment time should be four minutes. However, the dose applied during that time is too strong because according to the square law, three minutes will produce the required biological result. We therefore may state, that using the formula of Witherbee and Remer for smaller focus skin distances we overdose. For larger distances we underdose, as shown by the following example: For 16 inches the time is to be quadrupled, while according to Witherbee and Remer it is only to be doubled as compared with a distance of eight inches. Therefore too small a dose is applied, if the focus skin distance is increased.

Another error reveals itself, if we compare the values given for various filter thickness. According to Witherbee and Remer an increase from no filtration to 1 and 2 and 3 mm. Al changed erythema times in the ratio only from 1 to 1.2, to 1.5, to 1.6. An increase to 4 and 5 mm. Al however, increases the treatment time immensely, to 2.6 and to 4.5. An increase to 6 and 7 mm. does not effect the treatment time at all. This stepladder curve can not be correct. Failla's absorption curve and my measurements prove that the absorption steadily increases with increasing filter thickness. Thus the formula of Witherbee and Remer can not be used to compare radiations of different filtrations.

In order to overcome all these inaccuracies I have developed a formula based on more exact physical principles and on physico-biological investigations.

The treatment time can be figured as the product of the focus skin distance and a physico-biological factor, divided by the spark gap and the milliamperage. The focus skin distance and spark gap should be measured in inches. The physico-biological factor depends on the biological effect desired. It is given for three conditions, namely a skin unit, a mild, and a pronounced erythema. It further depends on the filter used and increases gradually with an increase in filter thickness. The mentioned factor changes somewhat with the spark gap used. The values given in the charts apply to a 7 and 8 inch spark gap; for 6 and 9 inches they vary a little. This variation, however, is not very pronounced and has been neglected, in order to make

*Read at Denver X-Ray Radium and Physiotherapy Meeting, Feb. 20, 1924.

$$\text{Treatment time} = \frac{\text{Inches Foc. Sk. Dist. Square} \times \text{Phys. Biolog. Factor K}}{\text{Inches Spark Gap Square} \times \text{Milliamperes}}$$

mm.	Skin F Unit	Mild F Erythema	Pronounced F Erythema
O—	20	30	60
2 Al	38	55	110
4 Al or 1/10 Cu	47	67	134
7 Al or ¼ Cu	52	75	150
½ Cu	55	78	156
¾ Cu	56	80	160

mm. Al	Skin K Unit	Mild K Erythema	Pronounced K Erythema
0	4	6	7
1	8	11	12
2	12	18	19
3	19	27	26
4	25	36	35
5	32	46	45
6	40	52	57

the formula less complicated and more easily applicated.

In order to show the simplicity of this formula, let us figure an example. The following conditions shall be used:

9 inches spark gap.
5 ma.
3 mm. Al.
14 inches FSD.

The time to produce a mild erythema shall be calculated.

According to our formula.

$$t = \frac{14^2 \cdot 27}{9^2 \cdot 5} = 13 \text{ min.}$$

According to the formula of Witherbee and Remer.

$$\frac{9 \cdot 3 \cdot 13}{14} = 25$$

To produce a low erythema, that quotient should be $\frac{21}{2} = 10.5$.

Thus according to their formula 13 minutes is much too long, and about 6 minutes would produce a low erythema.

Biological observations have shown that about 12 to 15 minutes are required to produce a mild erythema.

To determine a well pronounced erythema we have to replace factor 27 to 54. A dose, little lower than an erythema dose, which nearly corresponds to the skin unit dose of McKee can be determined by the factor 19.

This formula considers most of the physical principles which underlie dosage; but it does not and can not consider all factors which determine the dosage. For instance, it does not consider the size of the field. The formula has been constructed for middle sized fields of 1 to 2 inches diameter. For smaller and larger portals the treatment time is somewhat longer and smaller, and must be estimated. It also does not take care of the variation existing between different transformers and tubes, and of the inaccuracy caused in the measuring of the length of the spark gap. The variability of the spark gap reading with altitude is mostly not considered. Furthermore the focus skin distance is very often estimated instead of being measured, resulting in great inaccuracies, as the time of treatment varies with the square of the distance.

If we wish to avoid all these inaccuracies we have to abandon the indirect method of determining the dosage, and we are compelled to make measurements with the exact conditions of treatment.

The most convenient instrument to determine surface intensities is the Fuerstenau intensimeter. It reads the intensity of the x-radiation as an amperemeter reads the intensity of the electric current. However, we have to know how many F units should be applied. The values given for this instrument are mostly too high. For instance, in many cases 170 F are claimed to produce an erythema dose. This dose is a little too high for heavily filtered radiation, as used in deep therapy work; it is much too high for superficial treatment work, especially with unfiltered rays. According to my measurements only 20 to 40 F are required to produce the reactions mostly required in superficial treatment work. The chart on the slides gives you the values of an instrument which I am using to standardize transformers for superficial as well as for deep therapy technique. These values show, that we have to adapt our dosage to the factors of the technique used. While with the unfiltered rays about 30 F are required to produce a mild erythema, with 3 mm. Al about 50 F are required. In deep therapy work with about 200 kv. and 3/4 mm. Cu, 56 to 80 F produce a mild erythema. These values are correct for my instrument; they vary somewhat for other instruments. Therefore intensimeters before being used should be compared with other instruments or should be standardized. Then each treatment can be controlled and inaccuracies or serious errors can be easily avoided. To summarize:

(1) A formula has been developed which permits the calculation of the treatment time for various kilovoltages, milliamperes, filtrations, focus skin distances, and biological reactions.

(2) The use of this formula, as the other indirect method of determining the x-ray energy produced, suggests to start treatment time about 10 or 20 per cent below the calculated time, as a margin of safety, until the biological reaction is known.

(3) In order to make direct measurements of the energy produced possible, the error of hardness of an intensimeter has been determined. A standardized intensimeter is a very convenient instrument to secure accurate dosage.

Preoperative Roentgen Treatment of Malignancy*

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IT IS now a well-established fact that x-rays applied in sufficient dosage to malignant cells, will either kill them outright or render them incapable of reproducing when transplanted to another part of the body. This being true, and there is an abundance of evidence to prove it, why is not preoperative roentgen treatment of greater value than postoperative treatment?

The literature on the subject is rather meager. In seeking an answer for this one must come to the conclusion that the medical and surgical profession as a whole is not familiar with the benefits to be derived from raying patients before the surgical attack and therefore do not refer their cases for this method of treatment.

As carcinoma of the breast is most frequently referred for roentgen treatment, I will confine this paper more particularly to it.

The surgical treatment of this disease is not all that could be desired. If the axillary glands are involved good authorities state that from 5 per cent to 12 per cent only, are cured by surgery alone. Therefore one must believe that either all the cancer cells cannot be removed surgically or that during the cutting and manipulation necessary in removing the breast and adjacent glands, some of the living malignant cells are disseminated through the wound, finding their way into the lymphatic or arterial circulation.

The breast is unusually well supplied with lymphatics. There is a deep set around the lobules and ducts and a superficial set which together with the deep set forms a plexus around the nipple. They drain toward the axilla into the nodes along the border of the pectoralis major, also into nodes around the subclavian artery and into the anterior mediastinum. Sappey states that some of the lymphatics even of the sternal portion of the breast drain into the axilla. The deep axillary nodes receive lymph vessels from the skin of the upper portion of the thorax, from the mammary gland and from the pectoral muscles. Having so rich a supply of lymphatics in an area to be amputated certainly contributes to the likelihood of dissemination of the malignancy even though the operator be an expert in this branch of work. We may then say that it is impossible to operate in such a field without getting malignant transplants or leaving malignant cells in situ, in at least 90 per cent of cases operated. This is productive of too high a mortality and some means should be devised to reduce such an unsatisfactory percentage. Any logical method of doing this would be welcomed by the surgeon, for our greatest aim is the prolongation of life and the relief of suffering.

Dr. Deaver states that competent postoperative roentgen treatment enhances the prognosis by 25 per cent. Other surgeons also concur with this opinion.

This percentage, I believe, can be further augmented by one series of thorough preoperative x-ray treatment, to be followed in two weeks by surgical removal of the breast and lymph glands. The malignant cells at this time have their reproductivity greatly reduced, show lack of mitosis, giant cell formation, and nuclear changes as a result of the roentgen treatment. The lymphatics also are undergoing beginning fibroid changes due to the action of the rays on their endothelial lining.

Sittenfeld states that intensive raying before operation will prevent transplantation of live cancer cells in the field of operation. Several years ago he experimented on rat cancer, determining that a malignant tumor excised from a rat and given a large dose of x-ray will fail to grow upon re-inoculation.

F. Hernaman Johnson regards the time before operation as a particularly favorable opportunity for radiation treatment on account of its bringing about a weakening of the malignant cells and an increase of the resistance of the body cells as a whole. The chance of disseminating the carcinoma is thereby much reduced.

Dr. Oschner in a recent article says he feels we should treat all cases of malignant growths with x-ray before operating. He believes this kills the cells that have progressed beyond the field of operation, produces immunizing substances and prevents grafting of the carcinoma.

L. K. Poyntz describes a new and interesting method of treating malignancy by surgical removal of an easily accessible portion of the tumor. It is then dissected free from all fat and adventitious connective tissue, finely ground and spread out in a thin layer in a sterile Petri dish. This is immediately exposed to x-ray for 32 minutes from one side, turned over and again exposed the same length of time from the other side. The rayed material is then introduced into linear incisions in the recti muscles and the wounds closed. Three cases were so treated and at the end of three weeks he states they all appeared to be free from metastatic involvement. Two of the cases had preoperative roentgen treatment. He claims no originality for the method.

Many other well known authorities could be quoted who now believe in preoperative roentgen treatment of cancer. It is also proven beyond doubt that an enzyme is produced or released that aids in destroying malignancy, thus augmenting the direct action of the rays on the cells.

Before treatment is begun stereoscopic plates should be made of the chest to ascertain if there is metastasis in the lungs, pleura, mediastinum or ribs.

My technique for this treatment has been 10 inch spark gap, 5 ma., 12 inch target distance, filter 6 mm. aluminum and a layer of sole leather, and a 30 to 40 minutes exposure over each area. The entire half of the chest including the supraclavicular region on the involved side is treated in this manner at the rate of two or three areas a day, providing the patient's general condition will permit. If the reaction is too severe only one area per day may be given. Two weeks after the roentgen treatment a radical operation can be done. At this time only a partial fibrosis has taken place and operation is not rendered more difficult. Postoperative treatment should be begun soon after the patient is able to be about; as a rule this will be approximately three weeks. It should not be put off for months as is sometimes done. The patient's chance for complete recovery is greatly reduced

*Read at the annual meeting of the American College of Radiology and Physiotherupy Omaha, September, 1923.

when advised by the surgeon to seek x-ray treatment only upon return of the growth.

The following are two cases illustrating effects of preoperative treatment:

CASE I

History: Maiden lady age 55 years. Had usual diseases of childhood, enjoyed good health until the present time. Inspection shows nipple retracted, and on palpation a lump in breast just outside the nipple line the size of an egg. There has been bleeding from the nipple several times. Axillary glands could not be palpated. Clinically the tumor had the appearance of carcinoma. Five weeks after treatment the lump had entirely disappeared and the nipple became more prominent. Two series were given under the technique previously described.

Case II

Patient age 17 years. Father's father died of cancer of the stomach, otherwise family history is negative.

Began menstrating at age 13, periods were regular and no pain. Appendix was removed November 1919, no pus.

Patient now has a tumor in right groin above Pouparts ligament, size of fist, first noticed three months ago. Clinical diagnosis by surgeon was sarcoma and on account of its location he preferred not to operate.

Two series of treatments were given using the previous technique. The tumor became smaller and had a more solid feeling on palpation. She was operated on about two weeks after the second series.

Microscopic findings: In sections taken from five different parts of tumor mass there are well developed collagenous fibers interlacing and running in every direction. Interspersed among fibers are fibroblastic cells of fairly uniform size and shape occupying a lesser portion than do the fibers. There are, however, occasional mitotic figures. Only an occasional wandering cell is present. There is swelling of the endothelial lining some of the blood vessels, which are only of moderate number. In the section of the firm nodule deep in the large mass is an extensive scar tissue formation with quite acellular areas. Sections of the small mass beyond the boundary of the tumor proper show bits of muscle, hyaline changes in the connective tissue and scarring. Diagnosis: Sarcoma.

This case illustrates the changes the cells undergo after roentgen treatment.

CONCLUSIONS

1. Though statistics are meager I am convinced that preoperative roentgen treatment is of decided value to the patient.
2. X-ray treatment in sufficient dosage renders malignant cells incapable of reproducing when transplanted in other parts of the body.
3. This form of treatment should be more generally recommended in the future than it has been in the past.

X-Ray Treatment of Uterine Fibroids*

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IN 1904 the French first reported the successful treatment of uterine fibroids by the use of roentgen therapy. Thousands of observations have since that time been made in all countries and the success of this treatment has been satisfactorily proved.

The first question to be taken up is why the uterine tumor disappears after radiation by this means. The Germans believe that this radiation over the ovaries produces the results in the atrophy of the uterine myoma and that the reduction does not begin for four to six months. On the other hand the French radiotherapists hold that it is the action on the uterus and that the reduction in size of palpable uterine tumors begins with the inauguration of the treatment. M. Beclere, of Paris, believes the rays act immediately and directly on the fibro-myomata and the reduction is not a change in hormones. He cites the fact that a fibroid may either atrophy or grow larger at the natural menopause. In most instances the atrophy becomes noticeable at the third and sometimes even after the second sitting. The reduction by irradiation of uterine fibroids which continue to grow after the menopause is a convincing proof of the immediate and direct action of roentgen rays upon this type of tumors.

The endarteritis obliterans produced by the radiation brings about an anemia of the tumor with its atrophy and destruction. The x-ray inhibits ovarian stimulation, destroying the ripening follicles first through the primordial follicles and lastly through the ovarian interstitial tissue itself. If only the destruction of part of these follicles take place there will be a recurrence of the menses.

ADVANTAGES OF THIS METHOD OF TREATMENT

The advantages are many, particularly as to the comfort and safety of the patient, when properly given.

1. The treatment is painless, safe and there is no mortality.
2. In properly selected cases there are no failures.
3. The menopause is not attended by any serious symptoms as this is brought about gradually and is not a sudden shock to the nervous system.
4. If failure occurs one may resort to surgery. This only happens in one per cent of the cases.

CONTRA-INDICATIONS

In a general way at the present time it is not a question of contra-indication to roentgen therapy of fibroids but what are the complications making it necessary to operate. This may be described by the following conditions accepted as contra-indications at Deoderlein's University Gynecological Clinic. (Strahlentherapie, 12:1921).

1. Very large myomata extending above the navel.
2. In cases in which it is desirable to retain the menstrual function of the uterus.
3. All myomata with malignant regeneration.
4. Purulent or gangrenous myomata.
5. Subperitoneal pedunculated myomata.
6. Completely or partially prolapsed submucous myomata.
7. Myomata with tumors of the adnexa.

*Read at the Annual Meeting of the American College of Radiology and Physiotherapy, Omaha, September, 1923.

8. Myomata which cause compression symptoms.

Method of Treatment

The most universally used method of treatment is that of small doses broken up into intervals of a week or more until the results are satisfactory. The most of radiologists do not favor the one dose method. Each has its advantages and disadvantages as the massive dose method has more radiation sickness after the treatment, and probably produces a more pronounced menopause with its attending symptoms. A single castration dose is not always sufficient and a second radiation is sometimes necessary. The fractional dose method is more productive of a mild menopause with a more gradual return to a normal size of the uterus. It has been my observation from high voltage treatment that the shock is not much greater by the one dose method. You have the immediate disadvantages with a rather quick recovery of the roentgen sickness and anemia which is not any worse than to treat at weekly intervals, knocking the patient out at these stated periods before time for a complete recovery from the preceding treatment. It seems to me that the accumulated effects of treatments given over a long period of time apparently weaken the patient more permanently than the one dose method. It is far more practical to put your patient to bed, giving the needed amount at intervals of one day, than to spend the necessary time by weekly or monthly treatments. Then again if the patient is from a distance it entails a greater expense and many extra trips to the hospital.

Schmidt of the Gynecological Clinic of the University of Baum claims a single castration dose is 100 per cent lasting while serial irridation is only 98 per cent. He says, "the ill effects are not more severe after a single session than they are after a series of radiations."

My present technique is one large field both front and back, the area on the front taking in the uterine and ovarian region, than turning the patient over for treatment through the back radiating through the corresponding areas.

The voltage used is 200,000 with heavy filtration and 50 centimeter target skin distance. This method in my opinion is superior to the old cross-fire method with smaller areas, less distance and low voltage. The latter method rendered very good results and occupied more time.

It is best to radiate during the first half of the intermenstrual period.

Results

The results of roentgentherapy of uterine fibroids are universally good. Beclere reports 700 cases treated with one per cent unsuccessful, there being nine cases requiring surgical treatment.

There is an accompanying atrophy of the uterus with young connective tissue taking place of the fibroid tissue which has been destroyed and carried away by the leukocytes. The interstitial tissue of the ovary is not completely destroyed, therefore the hormone action is not entirely lost.

The reduction in the size of palpable uterine tumors begins with inauguration of the treatment. In most instances where the broken dose method is used it becomes noticeable at the third, sometimes even after the second series. From week to week the upper pole of the uterine tumor approaches more or less rapidly the pubic symphysis and in most favorable cases it may approach this point at the rate of about one centimeter in a week. This reduction in size is more rapid after radiation than after the natural menopause. After the physiological menopause a fibroid may continue to grow gradually and slowly, or, several years after the natural menopause the growth may begin to grow suddenly and rapidly. It is observed that fibroids radiated some time after the natural menopause improved the same as in menstruating females. This is satisfactory evidence that it is not alone the radiation over the ovaries that produces the results.

It usually takes from three to eight months for irradiated fibroids to completely disappear. A permanent cessation of the menstrual function usually follows the third month. If they do not totally retrograde the bleeding will stop, they will be much smaller and the pressure symptoms will be relieved. After the lapse of several months the results are very satisfactory and after all treatments are discontinued the tumor continues to subside and even after months and years it will become smaller. Twenty per cent of women have fibroids and as the most are harmless the patient does not know of its presence.

Sometimes the larger the myoma the better is the result as an intramural hemorrhagic myoma extending above the umbilicus may recede rapidly and in six months to one year be not palpable.

When there are other pathological lesions such as cervical erosions these will always disappear after this mode of treatment. Very rarely does a cancer develop in these patients after being properly radiated.

In patients under 38 to 40 years of age or younger the treatment may be so prolonged as to produce a mild menopause. This is produced by longer intervals and smaller doses. There are very few cases on record where a pregnancy has occurred after a satisfactory treatment is given.

Suppression of the menstrual function is easier after 40 years of age than in younger individuals.

CONCLUSION.

Roentgentherapy is a satisfactory method of treating uterine myomata and uterine hemorrhage at the menopause without demonstrable pathology.

The risk of failure after roentgentherapy is so small it is not to be considered.

In a general way it may be said that hemorrhage due to fibroids should be treated by radiotherapy in those women in whom a permanent menopause is not objectionable.

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Doederlein's University Gynecological Clinic (Strahlentherapie, 1921, XII).

Discussion.

Dr. Skinner: This is an excellent paper. Dr. Yocom brought out all the points. As he started to read, I thought of many things I would like to discuss. Before he got through he covered all excepting my general opinion upon fibroids, and that is that the field for fibroid therapy is one of the most satisfactory fields of therapy we have. I have treated them with gas tubes, then with the Coolidge tube, and I think I have gone to 140,000 volts with it. I think the fact that a therapy which is as flexible as that has been successful indicates the merit of this method of treatment. Any therapy which is successful in a varied dosage and with different types of apparatus, is a good therapy.

We handle our out-of-town cases by giving a brief treatment and sending them home. If they live in our city we take more time. We get just about the same results. The size of the tumor does not much matter because the first case we had fifteen years ago was one of a very large tumor—as large as a foot ball—and it began to melt away gradually, and the patient is still alive and happy.

I am not worried about the degeneration of fibroids, because the per-

centage of degenerations about equals the unavoidable operative mortality.

I think there is one thing we should be careful about, and that is to tell our patients frankly about the treatment and the way they will feel afterward. We will produce a menopause, and they will have the symptoms which women have after the menopause. If we do not tell them those things, they are very likely to attribute all those symptoms—the hot flashes and back ache—to the x-ray treatment; so I feel they should realize their symptoms will only be those which they might have had to undergo following the natural menopause. I think it is very important. People are becoming familiar with x-ray therapy nowadays. Just the other day I had a little patient whom I had treated for thyroid who told me her father had never been of good mind since he had been treated for a epithelioma of the face. It is difficult to believe any x-ray treatment is responsible for any such symptoms. She is thirty-nine years of age.

I think we should discuss those things with our patients so that they do not blame us for the symptoms for which we are not responsible. (Applause.)

The Treatment of Chronic Prostatitis by Electrotherapy*

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IN THE treatment of chronic inflammatory conditions of the prostate, certain factors must be taken into consideration, which, when properly considered, explain the futility of the time-honored methods employed by physicians in the treatment of such cases. It is a well known fact, that sufferers from chronic prostatis, usually drift from one physician to another, then to the chiropractor or divine healer, and finally becoming wholly discouraged give up to a life of semi-invalidism and patent medicines.

Chronic prostatitis is almost invariably the end-result of a gonorrheal infection. And in the majority of cases, is induced by the injudicious injecting of various remedies by the patient or by unwise instrumentation on the part of the attending physician.

The prostate gland almost encircles the deep urethra at the outlet of the bladder. It contains some thirty or more branched tubulo-alveolar glands, embedded in a mass of muscular tissues. These glands open through their ducts directly into the urethra.

On the introduction of infection into these glands, there is the usual acute inflammatory reaction, which is followed in the chronic stage by the formation of fibrous (scar) tissue. This may cause obliteration or obstruction of the gland ducts, thereby preventing the escape of bacteria and cellular debris, which lie bottled up and may cause trouble for many years. The physician has treated this condition by prostatic massage and deep urethral injections of weak solutions of silver salts with somewhat unsatisfactory results, and, urologists in general, while accepting this form of treatment as standard, frankly admit that few cases of chronic prostatitis leave their offices cured. The mechanical emptying of such glands, as have remained patent, by the prostatic massage is to be commended, but many prominent urologists have long maintained that the injection of antiseptics into the deep urethral merely irritates the urethral mocosa and tends to form more scar tissue, thereby doing more harm than good. These tubulo-alveolar glands are so formed that they effectually prevent the introduction of fluids from without inward, and it is highly improbable that even the minutest quantity of the antiseptic injected finds its way into the glands. I feel that we can discard the deep urethral injection as a procedure that is not only useless but harmful to the patient.

Now, taking for granted that the accepted deep urethral injection is of no benefit, what other procedure can we resort to for the treatment of this condition? We know that massage alone will not cure the condition. We likewise know that medicines taken by mouth or hypodermically cannot reach the gland in sufficient concentration to be of much benefit, we must, therefore, search for some agent that will set up a healthy reaction within the gland, and that will not produce injury to adjacent organs and tissues. Fortunately, we now have an agent in what is commonly termed diathermy. This merely means the application of currents of electricity of low tension and high amperage which produce heat within the deeper parts of the body.

It has been found that gonococci cease to multiply and cannot long exist when subjected to a temperature of 104 degrees Fahrenheit. Sampson claims that it is possible to produce a temperature within the tissues by the use of diathermia to as high as 138 derees F. without injury to the tissues. This being correct, one can easily see how effective this modality will be in the treatment of an old gonorrheal infection of the prostate. Furthermore, the application of heat within the gland causes a marked hyperiemia, with increased vasculrity and consequent increased activity of the secretory glands; the increased blood supply aiding in the absorption of waste products and the secretory glands mechanically washing out accumulated concretions and cellular debris. There is also an attraction of leucocytes to the part with consequent destruction of bacteria. In other words, we simply induce within the old, stagnant prostate, a healthy reaction which is identical with nature's method of combating infection. We have all of the factors found in a healthy inflammatory reaction except the pain, and diathermia is painless. Neither are we introducing some foreign substance, usually a poisonous mineral salt, into the system, which must be absorbed by the system with more or less damage to vital organs.

As the prostate gland is easily accessible through the rectum, we have no difficulty in applying one electrode in contact with the gland. For this purpose a prostatic electrode hollowed out on one side and capable of being easily introduced into the rectum and fitting snugly over the prostate should be used.. The larger, indifferent eletrode should be placed

*Received for publication March 13, 1924.

on the abdomen so that its lower edge is about one inch above the symphysis pubis and at least that far from the hip bones. I have found that whenever possible the current will follow the bones in preference to the softer tissues. For this electrode, either wire mesh or block tin should be used. It should be about five inches in diameter and should be well soaped and in perfect contact with the skin. In introducing the prostatic electrode, I find a coating of glycerine quite effective.

To be successful in this work, it is imperative that one use a machine which has a capacity of at least three thousand milliamperes. While I never employ more than half that amount in treating, still I get better results with the larger machines than I obtain with the smaller types that must be pushed to capacity.

I have one of the smaller machines, but seldom employ it for diathermia treatments. There seems to be a difference in the rapidity of the oscillations, which probably explains the better results obtained by using the higher type machines.

While I have discussed the good effects produced by the internal heat, I have failed to mention another reaction which I consider of far more importance than the mere production of an internal hyperemia in the diseased area. With the rapid transmission of these electrical charges, there is set up within the tissues a certain amount of chemical action. We have all watched the experiment in the physical laboratory wherein electricity was allowed to flow through a U-tube containing water and have seen the liquid transformed into its component gases, oxygen and hydrogen. We have likewise studied the reactions taking place in the wet cell batteries, and later on have seen how complex molecules may be broken up by electricity into simpler compounds or even into the elements. That such a reaction occurs during the transmission of the current through the tissues of the body is quite apparent. We mentioned above that the prostate lies at the outlet of the bladder. As is well known, with inflammatory conditions of the prostate there is more or less obstruction to the out-flow from the bladder with a consequent accumulation of salts and complex protein products along the walls and lower portions of the bladder. This is especially true in old men who have hypertrophied prostates with retention of urine. In the chronic prostate there are also crystals and an accumulation of protein substances, mainly cellular debris, which are affected by the passage of the current. That these substances are broken up into simpler compounds that are more readily absorbed by the blood stream can be demonstrated by the rapid decrease in shreds, etc., in the urine following a few of these treatments.

Another factor. We are also aware that most chemical reactions proceed only in a liquid medium, usually water. We have here the ideal location for chemical reaction, with the prostate and one electrode at the base of the bladder and the other above; and in giving these treatments, I prefer to have the bladder partially filled as I depend on this chemical exchange of ions to aid as materially in the treatment as the mere production of heat within the gland. What changes of temperature take place within the bladder, I will not state here, but there are changes, one can readily see. At the end of the treatment, I massage the gland to expel cellular debris and then have the patient void, thereby thoroughly cleansing the urethra, and expelling all foreign material discharged from the gland or stirred up in the bladder by the passage of the current. It would appear that to produce this effect, the galvanic current would prove the most effective, but clinically, I have failed to get better results where it was employed. Where there is retention of urine, I usually alternate treatments with the slow sine wave, placing the electrodes exactly as I do for diathermia, giving ten milliamperes for ten minutes with the idea that I ionize the urine within the bladder and break up the complex salts that so quickly accumulate in a condition of this kind. I believe the treatment to be justifiable.

In giving the diathermia treatments, I advanced the current slowly to about 1000 milliamperes, allowing it to run for twenty minutes and then turn it off gradually. I then massage the prostate, as mentioned above, and have the patient evacuate the bladder. The presence of material in the urine will act as a check on the progress of the patient. The shreds and cellular debris are usually excessive at first, but clear up as the treatments proceed. I give the treatments every other day in mild cases, and daily, where there is retention of urine in the bladder, washing out the bladder with a weak boric acid solution after the treatments if the patient's condition demands it. I have treated a number of cases of prostatitis by this method, and have yet to treat one that was not rapidly and materially benefited. I consider this method a distinct advance over the older methods, and believe that it will soon supplant all other procedures.

Deep X-Ray Therapy in the Diseases of the Female Pelvis*

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THE x-rays were discovered by Roentgen in 1895. In 1902, S. H. Monell reported the curative effects of x-rays in treating skin cancers, with complete cures lasting two years. An analysis of the methods then in use are enlightening. They gave daily treatments with low voltages, no filtration, five to six inches distance, ten minutes time; actual voltage and milliamperage unknown. They believed x-rays absolutely harmless. They invariably produced a dermatitis after a few days. They would stop a few days and then go merrily at it again, but they cured superficial skin cancer and lupus, probably with an even greater percentage of cures than is done today. But they were greatly puzzled because they could not affect deeper seated growths. Monell, in 1902 says, "Affected glands under sound skin have not yielded as good results." With the low voltage they were using, they could not penetrate to the glands beneath healthy skin, however, they invariably produced an erythema and cured skin cancers.

We hear a great deal of discussion in regard to the cancer dose, also that no one knows what it is. This may be true but from the history of the first x-ray treatment of skin cancer to the present day we will ven-

*Read before a meeting of Radiologists and Physiotherapists, Denver, February 1924.

ture the statement that cancer of the skin, which is visible, has not been cured and can not be cured without an erythema dose and most of them will require several erythema doses. This erythema may be given in divided doses; we will venture the opinion that a deep cancer must receive at least one erythema dose and probably a second. About 130 per cent of an erythema is the limit of toleration of the bladder and bowels. The skin will stand nearly a double erythema dose without permanent injury and these doses may be repeated in six weeks with safety.

During [illegible] of x-ray therapeutics, [illegible] days to this, there has been an endeavor to produce this same erythema in the deeper structures without causing destruction of the skin. X-rays as produced by modern transformers and Coolidge tubes consist of a wide range of wave-lengths. The longer waves are absorbed almost entirely by the superficial layers of the skin, the shorter ones are less easily absorbed and penetrate farther. Filters of various kinds are used to absorb the long waves which in excessive doses produce necrosis of the skin, the so-called x-ray burns. The voltages have been increased as fast as tubes could be made to stand them, because the shortness of the x-rays and their consequent penetration vary approximately with the square of the voltage.

By means of heavy filtration and high voltages, we have rapidly approached a homogeneous radiation which follows the exponential law of absorption, that is, each centimeter of the tissue will absorb the same percentage of x-rays which it received on its surface, as each preceding centimeter absorbed. Thus the skin or the first centimeter does not absorb proportionally a much greater percentage than is absorbed by the deeper structures.

This leads us to the problem of how an erythema can be delivered half way through the body as in deep seated growths in the female pelvis without giving an injurious dose to the skin, bladder and bowels. Several elements enter into this problem.

First: Filtration should not be less than ½ mm. of copper and 1 mm. of aluminum, if ample protection is allowed for the skin. The skin will stand nearly double a light erythema dose without serious injury if sufficient filtration is employed. Many laboratories require 1 mm. of Cu and 1 mm of Al.

Second: High voltages are necessary to produce a deep dose which must be nearly one-half of what is delivered on the surface. Let me illustrate why high voltage is necessary in deep therapy. With 200 kv., 4 ma., 62 mm. of Cu and 1 mm. of Al, 50 cm. distance, considered as a standard or 100 per cent, 39.5 per cent would be delivered half way through the pelvis. This dose is delivered by the modern x-ray machines with the above setting. With 140 kv., or 9.5 inch gap, (about what we could get from our old 10 inch machines) the factors other than voltage being constant, 16.2 per cent could be delivered half way through the body. It is practically impossible to radiate a pelvis uniformly and deliver a 100 per cent erythema through it with this voltage.

Our present technique calls for 200 kv., crest, 50 cm. distance, 1 mm. of Cu and 1 mm. of Al, erythema time 540 ma. min. The skin will stand 900 ma. min. which will produce a heavy erythema with superficial blisters, which will heal promptly without permanent injury to the skin: 42.5 per cent will penetrate half way through the average body of 20 cm. diameter and about 18 per cent will go entirely through. By reversing the patient and giving the same dose you will get 85 per cent half way through the body. $\frac{100}{85}$ x 540 ma. min. equals 636 ma. min. This plus 18 per cent which went through the body equals 750 ma. min. to skin and 540 ma. min. half way through the body. This is a safe dose to skin and deep tissues.

Third: The dose varies with the size of the field because of scattered radiation: Bachem gives the following figures.

Size of field	Intensity	Time	Energy.
20 by 20 cm.	100%	100%	630 ma. min.
15 by 15 cm.	95%	105%	630 ma. min.
10 by 10 cm.	87%	115%	690 ma. min.
5 by 5 cm.	77%	130%	780 ma. min.

Fourth: In case heavy dosage of the skin is necessary, wonderful results are now being produced in the treatment of x-ray burns by ultra-violet and deep therapy lights. The energy from the deep therapy lights lies mostly in the infra-red portion of the spectrum. In treating deep seated cancers of the female pelvis, we should get a light erythema of the entire pelvis, indicated by slight diarrhea and bladder irritation. The relief from this distress by deep therapy lights (1500 Watt) is unbelievable, so that we are now giving from half an hour to one hour a day of deep therapy light following each x-ray treatment and for a total of ten to eighteen days, until the erythema is beginning to fade. It is commonly taught that the beneficial effect of x-ray upon a cancer is due to a fibrosis. We do not believe this is so. We believe the fibrosis is an unavoidable effect of heavy x-ray doses and we find the deep therapy light overcomes it, and in addition has a beneficial effect in causing resolution of the growth, probably by increasing leucocytosis, and by improving the circulation. There is surely a wonderful diminution in the thickening of the skin and subcutaneous tissues following its use. There is almost complete relief of any distress, as a result of any erythema produced in the deep tissues.

While discussing proper depth dosage, we should discuss the use of radium as so many physicians think its use is optional in treating these female conditions. In treating malignancies of the female pelvis, if one had any assurance that the malignancy was confined to the uterus, surgical removal would be the thing. If we expect to cure a cancer starting in the female pelvis we must deliver an erythema dose throughout the pelvis as well as the uterus. Suppose we rely on radium alone, what will be our result? One hundred milligrams of radium placed in the uterus with the customary filtrations of 1.5 mm. of brass for 30 hours, or an absolute limit of 40 hours, would destroy the uterus and give an erythema to the bladder and rectum. The average pelvis is five inches in diameter. The quantity of gamma rays transmitted from a point source will vary inversely as the square of the distance. A dose sufficient to produce an erythema one inch from the center of the uterus would produce one-fourth of an erythema at two inches or one-ninth of an erythema at three inches distance. On the other hand, a curative dose administered to the outer pelvis would absolutely destroy the bladder and rectum because 400 per cent would be delivered to them. Radium is of value in giving a knockout dose to the uterus but is absolutely valueless in thoroughly radiating large areas or deep lying structures, such as the entire pelvis, when used alone. It must be accompanied by the deep x-rays of sufficient intensity to produce an erythema throughout the pelvis.

The main diseases of the female pelvis successfully treated by deep x-ray therapy are as follows: menorrhagia, fibroids and malignant conditions.

Menorrhagia.

An excessive or irregular uterine flow whose cause can not be found after careful examination, occurring at or near the menopause, leads to a suspicion of cancer. The percentage of these cases that become malignant justify radical treatment. An erythema dose given through the pelvis will stop the most obstinate bleeding of this type in a few days.

Case report: July, 1923, Mrs. M., wife of a physician, age 49, gave a history of excessive and irregular bleeding for the last year. Watery discharge, no odor, no pain. Has had several severe hemorrhages in which ergot and pituitin were useless. When a vaginal speculum was introduced to make examination, blood spurted from the uterus. The size of the uterus was about twice the normal, cervix normal; no cause discovered for the hemorrhage; patient quite anemic. She was given a full erythema dose over an area 20 cm. square both in front and behind. Diameter of patient 20 cm.; the following setting was used: 4 ma., 200 kv. crest, 50 cm. distance, filter 1 mm. of Cu and 1 mm. of Al, time 159 min. each front and back. Entire treatment was given in two days. She vomited once; four days after the treatment, hemorrhage had practically ceased. In December, the doctor reported that she had had no further bleeding and had regained her strength and activity. This is the type of case that might have been a beginning malignancy and we believe this type should receive a full erythema dose.

Fibroids.

Fibroids giving symptoms justifying interference may be treated surgically or with deep x-ray therapy. The operative mortality varies from 2 to 5 per cent. There is no mortality in the treatment of fibroids with deep x-ray therapy in the hands of properly trained roentgenologists.

Contra-indications to radiation treatment of fibroids are: pedunculated, submucous or excessively large fibroids, (larger than a large grape fruit), one undergoing degeneration or secondarily infected, those occurring in a woman of the child-bearing age where there is a probability of removing the growth and leaving a uterus capable of bearing children. If there is a questionable diagnosis or complications leave it alone; these cases should absolutely be treated surgically. At least one-half of all the cases are suitable for radiation and the results are excellent.

In regard to the possible malignancy of fibroids, Ewing says, "Malignant degeneration of myoma is rare. Mayo Clinic Collected Papers (Vol. XIV) states: "In 4,322 patients operated in the Mayo Clinic for uterine fibroids, in 1 per cent only were sarcoma cells found." At the Freiberg Clinic 1 per cent showed sarcomatous change.

Thomas A. Grover in a paper "The Roentgen Control of Uterine Bleeding," (The Southern M. J. 14:798) states, "Beclere reports 400 cases of fibromyomata treated with roentgen rays with satisfactory results. In only four instances was a subsequent surgical operation necessary." With a death rate of from 2 to 5 per cent in surgical removal it does not seem optional to advise surgery in that class of fibroids which are suitable for radiation with a record of no fatalities and 95 to 99 per cent cures.

Radiation affects a fibroid in two ways, first by castrating the ovaries, for which about 35 per cent of an erythema is necessary; secondly, by the direct action of the x-ray upon the tumor itself causing it to disintegrate and become absorbed. All fibroids do not disappear when nature castrates the ovaries at the menopause, neither will the x-ray castration dose always produce a satisfactory and complete result. Therefore, we believe fibroids should receive an erythema dose to get the direct effect of the x-ray of the tumor itself as well as the benefit of the loss of function of the ovaries. This is doubly beneficial if the fibroid should be about to undergo cancerous or sarcomatous degeneration. It is also desirable in cases that have passed the menopause without satisfactory regression of the fibroid, even though the hemorrhages are not excessive or often, as the castration dose would be of no avail. We do not believe radium alone is satisfactory except in very small fibroids. Radium in contact with the endometrium may cause absolute necrosis of the first centimeter and still leave a large area of the fibroid unaffected by the direct radiation, according to the inverse square law as explained above.

If you treat a woman with a fibroid at her regular period or near it, the following period will probably be excessive, the second period will be accompanied by a little or no showing of blood and the third by none. The tumor will steadily decrease in size, beginning in a very few days; as it gets smaller resolution is slower. The end results may be an almost normal uterus in size or one-half again as large as normal. The patient will be free of symptoms and improve in health and strength in a short time.

Case Report: Mrs. C., age 45. Uterus size of medium grape fruit; fundus two inches below the umbilicus. Had been having severe hemorrhages and was flowing at the time of examination and treatment. Hemoglobin, 60 per cent. Diameter of pelvis, 25 cm.; area treated 25 cm. square. In October, 1923, she was given 100 minutes each front and back using our usual technique. This was 50 per cent of a depth dose and was delivered in four days. She returned [illegible] January 24th, 19[illegible]. She reports that she had a rather profuse flow her first period, the second period was rather free and the third, no flow. Uterus was nearly normal in size; hemoglobin, 95 per cent. She says she measures 14 inches less around the waist, feels good and is quite active in social and home life. The skin was only slightly tanned; she did not go to bed during treatments.

Cancer.

Oliver C. Melson, (Mayo Clinic Papers, 14:420,1922 says, "The latest report of the Census Bureau contains the information that about 24 per cent of the deaths among women during the year were from cancer of the uterus. In cancer of the cervix, the operable cases in the series observed in the Mayo Clinic were 56 per cent in 1917, 45 per cent in 1918, 32.9 per cent in 1919, 23 per cent in 1920, 32 per cent in 1921. In cancer of the fundus, 44 per cent in 1917, 43 per cent in 1918, 49.5 per cent in 1919, 35 per cent in 1920, 47.6 per cent in 1921. The primary symptoms in order of frequency were bloody discharge, watery leukorrhea, frequent and prolonged menstruation, profuse menstrual periods, pelvic or low abdominal pain and bleeding after intercourse." These symptoms must be scanned carefully if we are to get these cases early. In the inoperable cases, which are considerably over one half, there is no help but radiation. The unfavorable results from operation and the increasing favorable results from radiation are rapidly placing all malignant conditions of the female pelvis in the class to be treated by radiation. At a meeting of the German Gynecological Congress in 1920, the concensus of opinion was that no patient with sarcoma of the uterus should be operated on since the results following radiation were so satisfactory.

Ewing, in his book on Neoplastic Diseases, (page 541-542) says, "The mortality from uterine cancer is very

high. Jacobson says, 'That of the women enjoying the services of the best American operators 35 per cent are inoperable, the operative mortality is 15.17 per cent; after five years, 8.39 per cent are well and 1 per cent of the total are permanently cured.'"

Ewing in discussing the Wertheim operation in commenting on the higher mortality and the inability of the majority of women to have a competent Wertheim operation says, "Because of these considerations a marked change has occurred during the last few years in the aspects of surgical treatment of uterine cancer, most surgeons preferring to reduce the scope of operability and others abandoning all operations for uterine cancer in favor of radium and x-ray treatment. Earlier diagnosis has doubtless contributed to improving surgical statistics and is equally important for radium therapy. In these directions lies the hope of a real advance in the therapeutics of uterine cancer."

We wish to quote a few paragraphs from the following article. Oschner, "Cancer from the Surgical Standpoint." (J. Radiol. 4:384, November, 1923.)

"As far back as the history of surgery reaches, surgeons have considered cancer curable in the early stages of the disease and entirely hopeless after metastases have formed. At the present time we feel that we should treat all cases of malignant growth with x-ray before operation. Scrapings or sections of the suspicious tissues were examined microscopically. At that time, these specimens were removed with the knife or curette. These patients died regularly from metastasis. Not a single case in which the scrapings or the piece excised with the knife showed the presence of cancer has escaped death as a result of metastases." Again, "So far then we feel certain that quite a number of lives have been actually saved by wide excision, preferably by means of the actual cautery and that many of our patients are alive today who would have died years ago had they not been treated with radium and x-ray either combined or singly."

Handley, "Cancer of the Breast," (2nd. edit., page 260) states, "The role played by radiation in the treatment of malignant disease is one of increasing importance, both on the preventive and curative sides." Again, "In my series of cases, recurrence in the skin has been almost absent. Three of the five cases in which it took place occurred among the small percentage of cases which had escaped the usual prophylactic course of x-rays."

We believe that all cancers of the uterus whether of the fundus or cervix, unless plainly localized, should be treated with deep x-ray therapy and, if it seems advisable, with radium to the cervix, or within the uterus, depending on the location of the cancer. It is criminal to use surgery alone or radium alone even in those cases thought to be confined to the uterus, in the light of the above statistics. A man who plays gambling devices when the chances are 100 to 1 against him is not supposed to have a very high order of intelligence.

Later statistics in treatment of cancer of the uterus, by means of deep x-ray therapy continue quite favorable. Even in the cases that appear hopeless, the relief from pain and the prolongation of life is well worth the while, with a possible 15 to 30 per cent of cures of inoperable cases. Practically speaking the roentgenologist sees no operable cases.

Opitz, of the Freiberg Clinic, (Am. J. Roentgenol. 10:925, November 1923) reports, "From January 1st, 1919, to March 31st, 1922, of 90 cases of the cervix, 24 operable cases of which 16 patients live, 8 are dead; 66 inoperable cases of which 29 live, 37 are dead; 42 cases of the body of the uterus, 25 operable cases, of which 20 patients live and 5 are dead; 17 inoperable cases of which 5 live, 12 are dead.

The technique we are now using is as follows: 200 kv. crest, 50 cm. F. S. D., 1 mm. of Cu and 1 mm. of Al as filter; erythema time 540 ma. min. with a large port of entry 20 cm. square. Formerly we gave the entire dose in two days, now we are giving it in four days and giving a deep therapy light treatment after each dose, also giving the light once a day for 10 to 18 days afterward. By use of the light we are preventing the irritating effects of x-ray on the skin, bladder and bowels as well as fibrosis in the deep tissues. We think the results on the cancer are more prompt and more complete and the patient does not complain so much from postradiation sickness and weakness, and regains her health and strength much more quickly. We believe a second dose should be given in six weeks followed by the light as above.

Case Report: Mrs. K., age 35. Had severe hemorrhage April 25th, 1923; had noticed a thin watery acrid discharge with a foul odor for a year previously. In June, 1923, she remortality from uterine cancer is very of radium in the cervix; hemorrhage ceased but still had a bloody discharge. She came to us for examination in July, 1923. The uterus was twice the normal size, very tender and painful on palpation. The vaginal vault was filled with an ulcerating mass which bled easily. Pathologist's report, squamous celled epithelioma of the cervix. Patient was practically bedfast, very anemic and weak with the typical cachetic look of the advanced cancerous patient. She was given deep x-ray treatment with our usual setting, 200 kv., 50 cm. distance, 1 mm. of Cu and 1 mm. of Al, 4 ma. The diameter of the pelvis was 17 cm.; area treated 20 cm. square; 140 min. were given in front and behind each on two successive days. The patient vomited some following the treatments and was weak for several weeks. She then gradually regained her health and strength and felt much better. On September 10th, 1923, she was given a 50 per cent depth dose. She is now free of all discharge, preforms her usual duties and feels fine in every way, a hopelessly inoperable case, but she is well and happy and living on borrowed time.

Conclusion.

The results in menorrhagia at the menopause and in 50 per cent of suitable cases of fibroids, place these cases in the class where there should be no option in the preference of radiation to surgery. Nor is there any option in the matter of the treatment of 50 to 60 per cent of cases of cancer in which the cancer is not confined to the uterus. The very small percentage of cures by surgery makes it extremely doubtful if any cancer of the uterus should be operated. In case surgery is resorted to, certainly postoperative or pre-operative radiation, preferably both, must be thorough and we believe two erythema doses should be given six weeks apart accompanied by treatment with deep therapy light (1500 Watt) from half an hour to an hour a day for ten to eighteen days.

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EDITORIAL

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A. F. TYLER, M. D.,
Managing Editor

Commercialism Versus Professionalism.

THERE has probably never been a time in the professional life of any one present when the future of the practice of medicine seemed fraught with so many possibilities; some of which, so far as our present perspective is concerned, are not the brightest.

In view of the fact that we as a people, or nation, are yet somewhat unsettled, or have scarcely attained our equilibrium following the general upset incident to the war, and that business of all kinds has been more or less demoralized, one might think that the economic situation of the medical profession is in keeping with the times while business conditions in general are in a great measure reflected in the business of the medical profession and to a certain extent influence the volume of business, fees and collections, there are other forces and agencies operating that contribute as much, and I believe more to this vexing and seemingly problematic future.

When we attempt to look into and forecast the future of medicine from an economic standpoint we are immediately confronted with two or three problems for solution and until some of them are properly disposed of so as to result in proper relations and co-operation among medical men, the profession must suffer.

Some of the questions that are absorbing the attention of the dictators of medical policy at this time are:

1. State medicine.
2. Decentralization—or the proper distribution of physicians.
3. The enlightening of the public along medical lines through the medium of the press, etc., or summed up in one word—advertising.

The consensus of opinion of practically every one who has given the subject study and thought is that the general trend is fast toward state medicine.

It is not the purpose to discuss this phase of the subject further than to mention it and suggest that the evil day can be postponed only by the cooperation of those most interested—the medical profession.

Decentralization means the scattering of physicians from the centers or larger cities to the smaller towns and rural communities. This procedure is dependent solely upon the economic situation of those individual physicians located in the centers and will triumph only when they no longer find it profitable or possible to so remain.

The question of advertising, or educating the public, if you prefer, is the one bug-bear of the physician, particularly of more recent years. A half century ago when medicine still retained some of its art, and had not been reduced to the commercial basis on which it finds itself today, advertising was given but little thought or consideration, other than the pompous personal appearance of the physician himself with his full beard, stove pipe hat, frock coat, etc. In those days an individual of these possessions was sufficient for any ordinary community so far as being a doctor was concerned. The populace were not favored with the valued therapeutic information now contained in patent medicine advertisements, to say nothing of the chiropractor and his ilk with his constant stream of propaganda relative to human life.

Today we find conditions vastly different to what they were even at the dawn of the twentieth century, and the situation is such that it behooves the medical profession to look well to its laurels.

These are questions concerning the profession as a whole, but in addition the separate branches of medicine, or the specialists, have their problems and it is of the problems of the radiologist that I wish to speak more in particular later.

Our surgeons today are more concerned about the economic side of their profession than ever before in their history. The question is continually being asked —where has surgery gone? Is it due to stringency of the times that people are not having operations as they formerly did? Why are our hospitals not filled with surgical cases as they used to be? These are questions of vital importance to the surgeon and certainly will influence to a degree the number of younger men specializing in surgery.

The answer to the above questions should be obvious. There is beyond a doubt as much or more surgery being done than ever before, but it is being done in private hospitals over the country rather than in the large centers. This condition is a natural consequence of the times, contributed to in a large measure by the extraordinary fee usually charged by the surgeon. With the public educated to the point where they were willing to readily part with a good sum of money for anything that savored of an operation this became an attractive field for the younger men, with the result that we now have a surplus of men in this specialty. The attitude of the average surgeon has been that he has usually demanded the "lion's share" of any fee the patient could afford to pay and for this reason many of them are not now willing to cooperate to the extent of permitting the radiologist to charge a reasonable consultation fee for an x-ray examination for diagnostic purposes, although as a general thing, they must be given credit for their willingness to cooperate in proving or disproving the radiologist's diagnosis of gall-bladder pathology, gastric

or duodenal ulcer, chronic appendicitis or other similar suggestive surgical condition.

Some of our internists of repute are following much the same course as the surgeon in relation to the radiologist. While the surgeon may occasionally have a chest or a gastro-intestinal examination made, to him it is worth only about five dollars or at the most ten. If more than this is permitted to be charged it just lessens his fifty to one hundred and fifty dollar fee that much.

The eye, ear, nose and throat men are obsessed with somewhat the same idea. They feel the need of an x-ray diagnosis, yet they have already sized the patient up as being able to pay only about so much and their own fee will amount to that much or more, so the radiologist should make his diagnosis for about half price.

Recently I was confronted with the statement from a doctor that if I would do sinuses for five dollars he could afford to have more of them done. My answer was that from the time I entered the practice of medicine I had never charged less than ten dollars for a consultation with another physician and I so regarded this case in question. As a rule however there are but few men in general practice who maintain an attitude of this kind. They refer a case for x-ray diagnosis and consultation and are willing that a reasonable fee be paid for the same. Likewise it is unusual for a patient to object to a reasonable charge unless he has been previously prompted as to what should be paid.

What does this mean to the radiologist? It can mean but one of two things. We can accept the dictates of some of our surgeons who but rarely feel the need of an x-ray diagnosis unless the patient insists upon it. We can submit to the contract prices of some of our internists or eye, ear, nose and throat men and degenerate into picture takers or at the most technicians, and permit the science of radiology to fall into discredit and disrepute, or we can maintain the integrity of the science as being one of the greatest diagnostic therapeutic measures known to medical science.

All men, and physicians although they are high up the intellectual scale, are not an exception, appreciate commodities in proportion to what they have to pay for them.

How many of you know of men who never needed whisky when it could be had for a dollar a quart who now would jump at the chance of buying it at ten or fifteen dollars a quart? The psychology is just this. So long as any commodity may be had at a mediocre or inferior price but few are particularly interested nor is it appreciated. But let that same commodity take a sharp advance in price and it immediately commands more respect.

The general rule when dealing with men is, you get just about what you pay for. Another is, that we are valued no higher than the value we place upon ourselves. The same is true of our services. If we place an inferior value upon our services the public and our confreres will value us and our opinion accordingly.

We sometimes hear from some of the other members of the profession that the radiologist's fees are too high and that the patient can not afford to pay the prices usually charged for an x-ray examination, consultation and diagnosis. I say consultation and diagnosis, for this is what it is, even though some of our colleagues seem to regard the procedure as just the taking of a picture, or taking a look through the fluoroscope to see whether their physical and clinical findings really tally up with the actual condition present.

Also we find quite a few who would give the impression that they are skilled at plate reading and x-ray interpretation, even though their training and experience along this line consists only of what they have picked up in observing the examination and a casual going over the plates with the radiologist in connection with an occasional private case of their own.

The matter of taking the picture or of turning on and turning off the machine is of small consequence compared with being able to interpret the findings as depicted upon the screen or plate.

Any one, of average intelligence, can be trained in a comporatively short time to become a first class technician or picture taker, but it requires a knowledge of anatomy, pathology and physiology equal to and greater than that possessed by the average surgeon, supplemented by extensive training and constant practice, to interpret x-ray findings. I wonder how much reliance would be placed on a microscopic diagnosis of some section of tissue made by an individual who had just casually picked up his knowledge by looking over a few sections in some laboratory and was now looking through a microscope only once or twice a week and in the meantime was giving his thought, study and attention to other things? The eye must not only be trained but must be kept in practice to be of any value. The same is true of x-ray interpretation, and yet this thing is happening every day. I am told that many of the dentists, practically all of whom have not had training in film interpretation, patronize the three and five dollar laboratories and insist that no diagnosis be given, so that they may make a diagnosis and charge an extra five for the same.

I am not inclined to the belief that the physicians who insist on small charges from the radiologist are playing this kind of a game, but I do wonder if the thought so often expressed, "The patient can not afford to pay a competent fee for an x-ray examination," truly reflects the whole sentiment in the case, and if it might not more properly be stated, "I have already charged them about all they will stand so I'll 'jew down' the x-ray man."

Now let us see whether the ordinary fees charged by the x-ray man are exorbitant as compared with those of other specialists. First we will take the surgeon. His training is no greater and in most cases not as great as that of the radiologist. For an office he requires a waiting room and a private office, and perhaps a small examining room. He requires one-third to one-half the floor space required for an x-ray laboratory, hence he pays one-third to one-half the rent. His equipment on the average is less than ten per cent of the cost of that of the radiologist. His overhead for doing business is somewhere between ten and twenty per cent of that of the radiologist. The actual additional cost of any particular examination is practically nil. A case is referred to him with the distinct understanding that he is not going to operate, but just for consultation. He proceeds to make his examination and render an opinion for which he charges you at least ten dollars, and worth every cent of it. Compare this with a ten dollar consultation with a radiologist, which requires just as much brain and as much time—to say nothing of bringing into use costly equipment, and an actual cost on each case of one to three or four dollars—and does the fee then seem so much out of reason?

Compare a chest case referred to one of our internists. The cost of his layout is likewise small compared to that of the radiologist. With a three dollar stethoscope and a dollar thermometer and a history sheet he proceeds to render a ten dollar service. He makes no additional outlay in handling this particular patient, but for the x-ray man there is a cost of at least ten

dollars in addition to the wear and tear on the gray matter involved in each instance.

As a further example let us take the eye, ear, nose and throat specialist dealing with a case of very indefinite sinus involvement (yet the patient is evidently seriously sick), referred just for consultation. Will the patient of average means get out for five dollars? Compare this with the man who asks for five plates and a radiologic consultation for the like amount and see whether it is equitable and fair.

While I am convinced that the x-ray could be used many times to advantage when it is not made use of, I am not pleading for more work for the radiologist, but rather for a square deal for patient and radiologist alike. The patient either needs an x-ray examination or he does not need it. This is for the referring physician to decide. If perchance it is thought the x-ray may throw additional light on the case, the physician certainly owes it to his patient to see that he gets it. He is supposed to be the guardian of the patient's health, rather than his pocketbook, and the overworked story that the patient can't afford it, is only a bit of flimsy camouflage.

The fees charged by the radiologist are as low as is consistent with progress and good work. To charge less than is charged by men in other specialties is to acknowledge inferiority, invite disfavor, and reflect discredit upon as great a science as is known to diagnostic medicine.

Can we not have a better understanding, care less about what the other fellow is doing in a financial way, and care more about our patients?

R. W. Fouts, M. D.

Sir Archibald Douglas Reid, K. B. E., C. M. G., F. R. C. S., England.

SIR ARCHIBALD DOUGLAS REID was knighted for his services during the World War. A British colleague, an associate of his early days, describes him in early manhood as a brilliant student with overflowing spirits but a serious man withal.

Born in 1871, he was one of the young men to embark upon the career of a radiologist when radiology was in its infancy. His quarters were modest, his equipment the meager, simple one of that early day but as soon as improved apparatus made its appearance this young man was ruthless in scrapping the old. Eventually he came to possess one of the best private plants in his native country, and today not only England but the entire medical world has suffered a great loss in his early death which took place recently in Switzerland whither he had gone to recuperate his general health. An acute abdominal condition came on and in spite of an operation he died.

He it was who dreamed the British Institute of Radiology, and by dauntless and indefatigable efforts started it on its way to the fulfillment of its great purposes. Nor did he stop there but had a dream of something greater yet, an international radiological organization which would go far toward helping on a brotherly spirit among the nations. He was told that the time was not yet ripe, but, as before, he replied that it was ripe for a beginning and that the rest would follow. Such were his abilities and his standing that doubtless he would have brought this dream to some tangible beginning of reality had he but lived a few years longer.

He was Superintendent of the Radiological Department of St. Thomas Hospital, and was radiologist and consulting radiologist in various other hospitals. He had served as Joint Secretary to the Radiological Section of the International Congress of Medicine held in London in 1913. In 1911-12 he was President of the Electrotherapeutic Section of the Royal Society of Medicine. He was a member of the Council of the Roentgen Society and Chairman of the Educational Committee of the British Association of Radiology and Electrology. During the Great War he was Chief of the X-Ray Service of the British Army, when he had to purchase the equipment for the x-ray service on the Western Front, for Gallipoli and the Suez, Palestine, Syria and Mesopotamia—a tremendous task and doubtless one which took great toll of his vitality.

An x-ray dermatitis, so serious as to necessitate several operations shadowed his happiness, but this, says his oldtime friend, was the only shadow in his life. There were no skeletons in the closet. His family life was ideally happy, his professional career a source of satisfaction and pride, "a pleasant life to look back upon, clean, wholesome and successful, with no undercurrent of regrets except that it has finished all too soon."

Walter C. Mills, M. D.

THE death of Doctor Mills, so untimely, is a great loss. Versatile, witty, happy-hearted, sympathetic, earnest—he was a man loved by many. Keen of observation, clear in judgment, patient in pursuit, tireless in his capacity for work, he was a true man of science whose efforts had already yielded much to the world in lasting achievement and one who can ill be spared from the field wherein he labored.

He was born in 1878 in Webster Groves, Missouri, and was educated in the public schools of that state, in the University of Illinois and in the St. Louis University School of Medicine.

After two years of practice in St. Louis he returned to his birth place where he practiced for six years and where he endeared himself to his fellow citizens by his service. Then, after a year of postgraduate study in New York City and in the clinics of Europe, he again toop up the practice of medicine in St. Louis, specializing in gastroenterology. Again in 1913 he visited the great clinics of Europe to study roentgenology under the great leaders there and returned to St. Louis to take up his specialty in association with Dr. Horace W. Soper. His work since that time has become well known through the valuable contributions he has made to his specialty.

At the time of his death he was President of the American Gastroenterological Association. During 1923 he was president of the St. Louis Society of Internal Medicine. He was a member of the American Medical Association, the Radiological Society of North America, the St. Louis Medical Society, the St. Louis Naturalists' Club, the St. Louis Anthropological Society and the American Ornithologists' Union.

No more just estimate is ever made of a man than by those with whom he works and we cannot give a better idea of the worth of Doctor Mills than to quote from the beautiful tributes paid him by his colleagues, his assistants and his intimate associates. These are to be found in the April issue of the Journal of the Missouri Medical Association.

From Dr. Horace W. Soper we quote: "His work as a specialist was sound because it was based upon a broad comprehension of the problem of the practitioner of medicine. His great work on *The Relation of Bodily Habitus to Visceral Form, Position, Tonus and Motility* * * * is epoch-making in character and establishes a clinical classification of anatomic and physiologic types

so clearly and definitely that it is eventually destined to be used by all teachers of clinical medicine. * * * His method was simple and direct. In his daily clinical work he noted every phenomenon with which he was not acquainted, catalogued and filed his observations for future reference. * * * He was a painstaking genius who put into his work the spirit and enthusiasm of the great artist. * * * He passed away in the midst of great achievement. He had climbed the heights and envisioned the great productive field of research before him. * * * We of this generation will probably not meet his like again. When we come to consider the character of our friend, his high courage, tenacity of purpose, prodigious energy and boundless enthusiasm—with his simplicity and personal charm—we feel that his loss is irreparable."

His secretary wrote: "What was there housed in this frail masculine body and that shone forth from those soft blue eyes which demanded respect, but which could also strike terror into one's heart? What was there in his rich mellow voice that made one love him? Why did this man lash and sting at coarse dullness? The answer is, Doctor Mills made life a 'beautiful, high, significant thing.'"

Dr. Hanan W. Loeb, Secretary of the Marion-Sims College of Medicine when Doctor Mills made his entrance there as a student, said: "He was a quiet looking young chap with deep-set eyes, unimpressive in his appearance and extremely diffident or at least bashful. * * * bereft of any outward expression of the fire that was in his soul. * * * In the three years during which he attended, he justified the impression of thoughtfulness, modesty and earnestness, but he drove far beyond the evidence of spirit, thoroughness, and happiness in his work that his features suggested * * * So far as he was concerned himself, however, he kept all of these high qualifications from public view, not as so frequently happens, to spring them suddenly and enjoy the distinction of spontaneity, but because his soul rebelled against any expression of pride whatsoever."

Dr. Evarts A. Graham: "The keen observation which could in a moment detect an abnormal condition where other eyes less keen might see nothing, had arrived at its perfection only through the tireless effort spent during many years in the school of hard work. * * * Despite the astonishing speed with which he seemed sometimes to arrive at a diagnosis his methods were in reality most laborious. The thousands of carefully kept routine records bear witness to the painstaking character of his work, records which because of the great care with which they have been made, will yet reveal new important generalizations of truth even though the author of them has passed on from amongst us. * * * To those who were most intimately associated with him, his thoughtfulness of others was always striking. * * * Even in the sudden shock of the information that he had leukemia one of his chief concerns was whether or not his assistants in the department were adequately protected against the injurious action of the x-rays."

Dr. R. D. Carman: He saw from many angles of view at once and he realized that the truth we all seek is many-sided. * * * With his saving sense of humor he would be the first to laugh at unearned praise. But, in sober truth, he was rounded out and balanced well. * * * It is not for us to pity his passing but to exult over what he did, to be glad that he lived, worked faithfully at the plans on the trestle-board of the Great Architect, loved his fellow men and has laid down to an untroubled sleep."

David M. Skilling, D. D.: "How tender he was! How considerate of his patients! I recall a stormy night in winter when he was called to see a patient in the country who was critically ill. He sent for me and asked me to come to him and remain with him a while as he cared for his patient. When I reached the house he said, 'This man is going to die and I am not going to leave him and I want you to be with him too.' We stayed with the grief stricken family throughout the night. I think he never received a fee for his service but I am certain that no man in all time ever worked more intelligently, skillfully and tenderly in the effort to restore a life than he did that night. * * * When Ian MacLaren was in our country * * * I asked him if 'Wheelum MacLure' was a real character or purely fiction. His reply was, 'There are many Wheelum MacLures.' A man does not have to reach the age of seventy or eighty years to be a Wheelum MacLure. Our friend was a Wheelum MacLure in his general practice and I know full well that he was also in his great work as a specialist. * * * He was a courteous Christian gentleman. He did not wear his religious experiences on his sleeve but his religious life was real. I am sure that in his walks through the woods he looked through nature up to nature's God and found that within him which taught him to worship God. * * * The work of Walter Mills was far greater and of more vital importance than the world has appreciated. His reward is not in material success but in the help he has given to humanity and in the approval of eternity."

The Bibliography.

AN EDITORIAL writer in a recent medical publication notes with pained surprise what has long been an annoying and glaring fault in the great majority of American medical writers, namely, such a lack of accuracy in bibliographies as to render them a source of much wrath to anyone attempting to look up the literature to which they refer. It is rare to find that a bibliography has been *carefully* and *accurately* checked by the author or by some one else competent to do it. Frequently the author jots down his references inaccurately, sometimes it is even worse than this and he exhibits a total lack of knowledge as to what a complete citation should include.

Recently the writer witnessed an author checking a bibliography appended to the manuscript of a really worth-while book which he was about to have published. The bibliography was long, the author was weary with an unaccustomed and an uninteresting task, a task much lightened for him, however, by the services (free gratis), of an excellent medical librarian. Several times the librarian remarked of a book, "Edition so and so," or of an author's name, "Initials so and so," only to be met with the reply—"Oh that does not matter." In citing the page, volume, month and year of a reference to a periodical she was told several times that the learned doctor cared not at all for one or the other of these items, he seemed quite satisfied if he had either the volume or the year. It never entered his head that many times, through some slip of the stenographer or the proof reader, the volume number becomes most useful as a check upon the year and vice versa, nor that the page number might save the reader's looking through the index of the volume referred to and thus save some busy doctor's time to say nothing of his patience.

Such carelessness is inexcusable but it is often met. Only the librarian and the man who does his own literary research has any idea of the waste of time and the annoyance so caused. Anywhere from five minutes to half

a day may be required to run down a reference. True, it is not often that the reference is needed badly enough to spend a half day searching for it, but sometimes it is. Another editorial writer recounts just such an experience. In looking up a certain bibliographic reference he traced it through five articles before he found the article to which the bibliography referred, for it was not original with B to whom A's bibliography referred, nor yet with C to whom B referred, nor to D to whom C referred, nor yet with E, but its father was finally discovered in the person of F. Rather an extreme instance but not a medical librarian in the country who does not have such an experience time and time again.

As the writer first referred to says: It is an imposition upon readers to present to them a list of references to the literature of a subject, only to have them discover after an annoying search that many of the references are incorrect, that some of the articles cannot be found, and that others have no bearing upon the subject."

Such slovenliness is a reflection upon American scholarship and often dims its brilliancy in the eyes of our more careful colleagues across the seas.

Organization of a Medical Intelligence Bureau for the Hot Springs National Park of Arkansas.

UNDER the auspices of the Garland County Medical Society of Hot Springs, a Medical Intelligence Bureau has been organized for the purpose of placing before the medical profession of America, a clearer and more exact knowledge of the therapeutic values of the waters of the Hot Springs National Park of Arkansas, in the treatment of diseases and conditions resulting from acquired or constitutional toxemias, faulty metabolism and defective elimination. Colonel L. M. Maus, retired, Medical Corps, United States Army, has been appointed Intelligence Officer and placed in charge of the bureau. From him we have received the following announcement which we believe is of value to the medical profession.

An advisory committee, consisting of three members of the local medical society, also members of the American Medical Association, has been appointed to cooperate with the intelligence officer in the management of the bureau. Clinical and other professional information relative to the uses of the waters of the springs in the treatment of diseases will be conveyed to the medical profession of the country through addresses before medical societies and conventions, contributions to medical journals, and the distribution of appropriate medical literature on the subject. Members of the profession are cordially invited to correspond with the bureau relative to cases, which have not responded to treatment at home, and to the advisability of sending them to Hot Springs for a course of treatment.

Although Hot Springs is owned and controlled by the United States Government and has been used, with increasing popularity, for more than a hundred years, it is believed that there is a general lack of knowledge throughout the medical fraternity of the country, relative to the healing and beneficial powers of the waters.

Recognizing the beneficial results of Hot Springs in the treatment of chronic rheumatism, arthritis and the various forms of chronic neuritis, more than forty years ago, the Government constructed the Army and Navy General Hospital here, where thousands of officers, enlisted men and veterans of the several wars have been successfully treated. Several years ago the Interior Department, at a cost of several hundred thousand dollars, constructed a public bath house for the poor of the country, where large numbers during all seasons of the year, are treated gratuitously regardless of race, color or sex, by medical officers detailed from the Public Health Service. * * *

Every facility has been provided at Hot Springs for the care and treatment of the sick in the way of bath houses, hospitals, sanatoria, hotels and boarding houses. Among the twenty or more bath houses are a number costing from one to three hundred thousand dollars each, and containing the most modern equipment for the different phases of hydrotherapeutic treatment. The climatic conditions are excellent and favorable at all seasons of the year for taking the baths, and are especially so during the warm weather, at which season skin elimination is more active.

Hot Springs is provided with an efficient medical staff, which measures up favorably with the profession throughout the country. They are not only required to pass a local federal medical board, but the state board of medical examiners, before being allowed to practice and prescribe the baths. The physicians, as well as the bath houses, are under the control of United States authority through the Park Superintendent, who is an officer of the Public Health Service. Sanitary inspections of the bath houses are made daily and are kept in excellent condition.

The Hot Springs of Arkansas were set aside by Congress in 1832 as a "National Sanitorium for all time and dedicated to the people of the United States, to be free forever from sale or alienation." Frequent physiological and chemical examinations have been made of these waters by government experts, and at the present time the Secretary of the Interior has asked another appropriation for that purpose. Professor Boltwood in 1904 declared that the waters of Hot Springs, Arkansas, were strongly radioactive and in 1913 Professors Hunt and Franklin of the National Research Council reported them, with few exceptions, to be as strongly radioactive as any European Springs. When the true therapeutic values of these waters become known to the Profession of America, and the many erroneous and prejudicial opinions of a generation ago swept away, the Hot Springs National Park of Arkansas will become celebrated as the world's greatest health resort, and prove inestimable in the cure and relief of suffering humanity.

Very respectfully,
L. M. Maus,
Intelligence Officer.

Hot Springs, Arkansas, April 18, 1924.

National Academy of Sciences Dedicated.

THIS dedication took place at Washington D. C., April 28th. In his dedication address President Coolidge said that one of the academy's greatest possibilities for service lay in its opportunity "for inspiring the people of America to insistence upon having the truth, and nothing but the truth, regarding everything that touches our life as a nation."

The Academy was given to the United States by the Carnegie Corporation of New York. It will be devoted to housing the National Research Council which is made up of leading scientists who are doing research work for the United States government.

It is a magnificent edifice of stone and marble, of outstanding beauty, and is located facing the Lincoln Memorial.

The Journal of Cancer.

THE first issue of this Journal appeared in January. It is published under the auspices of the Cancer

Research Fund, Ireland. No notice of the names upon the editorial staff is given but the January issue states that the journal is designed as a record of the study, experiments and general practice in the treatment of cancer and is published in the interests of the medical profession. Original articles, clinical lectures, medical society addresses and case reports are solicited.

Contributors to the first issue are Doctors Crofton of Dublin, Pilger of Dublin and formerly of Erlangen, Wintz and Rumpf of Erlangen. The second issue is scheduled to appear in April with the following contributors: Doctors Charles of Dublin, Mason of Glasgow, Steadman of London and Holfelder of Frankfort. Abstracts of the January issue will appear in the June issue of the Journal of Radiology.

ABSTRACTS and REVIEWS

Radiography and Radiotherapeutics. Part I, Radiography. By ROBERT KNOX, M. D., C. M., M. R. C. S., (Eng.), L. R. C. P. (London). Octavo. Cloth. Macmillan Co., New York City; A. & C. Black, London.

THIS, the fourth edition of this well known and comprehensive work consists of 448 pages of text illustrated by 334 figures and 88 plates.

The work has been carefully revised and additions made to the sections upon the liver, gall bladder and urinary tract. Practically no change has been made in the chapters on the chest and the gastro-intestinal tract as new volumes are in preparation upon these subjects.

The recommendations of the X-Ray and Radium Protection Committee are given in the appendix.

Rubber and Gutta Percha Injections. CHARLES CONRAD MILLER, M. D., Chicago. Oakwood Printing and Publishing Co., Chicago. Octavo. Cloth. $1.75.

THERE are 99 pages in this book giving a preliminary report of the use of various forms of rubber and gutta percha for raising the depressed nasal bridge and for filling in various tissue deficiencies. The manner of preparation is described and the apparatus used is illustrated.

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Diverticula of the Stomach from a Roentgenological Point of View. AKE AKERLUND, M. D., Acta Radiol. 2: 477-483, December 1923.

THE scanty statements found in the literature as to diverticula of the stomach, relate with two exceptions to so-called functional diverticula of the stomach, all of which in the opinion of the author, are misinterpreted diverticula of the small intestine situated behind the stomach and originating from the terminal part of the duodenum or from the region of the duodenal-jejunal flexure.

The author reports a series of five cases of roentgenologically diagnosticated organic diverticula of the stomach, personally observed by him. Four of these belong to the type of congenital diverticula and are localized to the cardiac region, the fifth one being a case of postoperative diverticulum within the canalis ventriculi, verified at operation.

The diverticula of the stomach are of the greatest roentgenological interest from a differential diagnostic standpoint. Roentgenologically they are characterized by a rounded shape, varying degrees of filling and distention, soft and mobile contour, and absence of roentgenological symptoms of an infiltration process in their surroundings. All five cases of diverticula of the stomach showed residues of the barium meal after four hours, and each of the four cases of cardiac diverticulum exhibited in erect posture a gas bubble in the upper portion of the diverticulum.

Three Cases of Roentgenological Niches in Cancer of the Stomach. G. CLAESSEN, M. D., Acta Radiol. 2:486-490, December 1923.

SCANT reports of the appearance of roentgenological niches in cancer of the stomach are to be found. They do thus occur and they are not always pathognomonic of ulcer. The niche rather indicates medical treatment than operation. The author reports three cases of gastric cancer in which the roentgenograms showed niches in the lesser curvature of the stomach. In one case the complaint had lasted only four months. In two cases there was free hydrocloric acid in the stomach. The size of the niches varied greatly. A large niche is indicative of cancer. Regular contour, unevenness and stiffness of the curvature was found in all these cases.

Trichobezoars in the Stomach and Their Demonstration by Roentgen Examination. C. M. ROVSING, M. D., Acta Radiol. 2:491-496, December 1923.

THE roentgen picture of these bodies is quite pathognomonic. Once seen the shadow cannot ever be mistaken in a second case. There shows a large defect in the stomach shadow almost through the entire stomach yet lacking the form characteristic of true tumors. It does not have the irregular indented and constant contour of the true tumor and to some extent it changes its appearance on manual pressure being exerted. Also, during fluoroscopy, one can ascertain by pressure the presence of a movable foreign body and push it up to a greater or less extent above the level of the barium meal. The shadow of the body is outlined against the light portion of the stomach shadow, due to the air bubble in the stomach, but on the whole is of small density as compared to the barium meal. As a rule there is a reticular appearance which is due to adherent portions of the barium producing narrow and broad shadow stripes crossing one another irregularly. The trichobezoar is always hook-shaped. Often the hair-ball will be found extending at quite a length into the duodenum.

Reliable Dental Information for the Public. EDITORIAL, INTERNAT. J. ORTHODONTIA, Oral Surgery and Radiology. 10:116, February 1924.

SOME members of the dental profession believe that some means should be found to provide the public with reliable information upon dental subjects, but every plan so far suggested has aroused much criticism. The dental profession in New York City recently had what at least

seems a practical plan suggested to it by one of the New York daily papers. This paper had decided to establish a woman's magazine to appear weekly and wished to make one section of it a dental section. To secure reliable information they applied to the editor of the First District Dental Society of the city. He presented the problem to the Board of Directors. The writer says that some of the objections raised were rather surprising and not a credit to the profession, however, it was finally unanimously voted to give the matter a trial. The Oral Hygiene Committee of Greater New York, which is a body made up from the dental organizations of the city, is to write, censor and edit articles to appear every Thursday in the New York American, Woman's Magazine Section. No names will be mentioned in connection with the articles and the personnel of the Oral Hygiene Committee is not generally known so there can be no question as to the ethical aspect of the matter. The articles will cover subjects relative to dentistry which the general public should know. There will be a form of questions and answers. The answers will be written by members of the Committee and the Committee will have the power to censor the answers.

The Dental Roentgenologist. S. M. GETZOFF, D. D. S., International J. Orthodontia, Oral Surgery and Radiography, 10:102-119, February 1924.

DENTAL roentgenography is valuable only in so far as it assists the dentist or physician to arrive at a correct diagnosis, and only by close cooperation can they arrive at any such diagnosis even with the best roentgenography.

No dentist in general practice can give sufficient time nor does he encounter a sufficient number of cases to make his opinion an authoritative one on any but the simplest interpretation. The general practitioner is also apt to fall into the error of overestimating the importance of roentgen findings. Nevertheless, the dental roentgenologist, properly so designated, must have had at least four years active clinical experience as a dentist prior to his special training as a dental roentgenologist. This special training should provide him with a knowledge of physics and electricity, the construction and use of roentgen apparatus, roentgen physics, the technique and chemistry of developing, the technique of intraoral and extraoral radiography. Following this he should have a thorough course in interpretation and for this it is necessary that he should have a general knowledge of medical roentgenology, particularly the roentgen study of bone diseases.

After all this he should have experience in interpreting thousands of cases in order to develop his clinical sense. This is to be gained only in a large hospital or clinic where there is vast material.

The author pleads for the adoption by dentists of an universal terminology. There is such close relation between medical and dental work that the two should use the same terminology. The medical roentgen terminology is of good basic value and is already in vogue and dental radiologists would do well to follow this established trend. A step was taken toward this at the 1922 meeting of the American Dental Association when it went on record as favoring the word roentgen prefixed to various terms.

Treatment of Soft Chancre by Total Radiation of Radium Salt, by DRS. LACAPERE *and* GALLIOT. Bull de la Soc. Fran. d. Dermot. et d. Syph., January 1924, pp. 28-33.

THE authors observe that the multiplicity of treatments for soft chancre indicates the difficulty of obtaining a cure, and that their method is generally applicable to all superficial erosions, namely, the application of a radium salt in a paste vehicle.

When a radioactive substance is applied on a healthy mucous membrane or an ulcerated surface, there is rapidly produced an abundant exudate loaded with a large quantity of leucocytes, sweeping away mechanically the infiltrating organisms. At the same time a powerful effect is exerted on the epidermic cells, leading to scar formation. This process is observed when a paste containing a minute quantity of radium salts is applied.

Before application of radiation the exudate of the soft chancre consists of a liquid containing a suspension of debris, of sloughed tissues, of pus cells, and microorganisms. The pus cells consist mainly of polynuclears with an admixture of small and large mononuclears, a number of them showing granular degeneration. The organisms are of variable flora among which very frequently occurs the bacilli of Ducrey.

After application there is a decided change in the exudate. On the first day after treatment the discharge shows many polynuclears well stained with no trace of degeneration. The microorganisms are still present in large numbers. On the second day, the polynuclears are absent, their place being taken by lymphocytes exclusively, containing numerous microorganisms. On the third day the mononuclears have also disappeared and the preparation shows the interlacing filaments of the mucus. On the following days the discharge ceases. Cicatrization takes place rapidly. The small lesions of recent duration disappear from six to eight days. It is slower in the extended lesions located on the internal surface of the labia minora or in the anal orifice. Especially in those of longer duration which had formed subepidermic foci of running pus it is necessary to repeat three or four times.

In none of the cases treated did a bubo supervene as the treatment is too rapid to permit the appearance of suppurative adenopathies.

New soft chancres occuring during the treatment as a result of autoinoculation yield to the same treatment.

Two tables demonstrating the comparative time of treatment by the older and newer methods show that the cases treated in the authors service at Saint-Lazarie with the classical methods required 20-80 days with average of 47 days for a cure, while with the radioactive pomade it required eight to twenty-one days, with an average of sixteen days.

The authors note that for the application of the radioactive paste it is necessary that an avenue of evacuation of discharge be wide open. Their administration of a few drops of a radioactive solution into inflamed Bartholin glands resulted in veritable hot abscesses requiring incision and drainage. The same is true of a closed adenitis.

In discussing the action of radiation on the lesion the authors note that there is no sterilizing effect on the microorganisms as the microorganisms stain well after application, and by their ability to reinfect prove that they have lost none of their virulence. Nor does the radiation increase any phagocytic action. The chief effect appears to be an extremely powerful chemotaxis on the leucocytes which come in large numbers first polynuclears, then mononuclears. At the same time the mucous glands are markedly stimulated and an abundance of secretion together with the leucocytes mechanically sweeps away the organisms. Stimulation to the epidermis produces rapid scar formation.

They also found that this treatment is at once antihemorrhagic and an-

aesthetic. The bleeding stopped immediately and the pain diminished markedly.

The authors call attention to the fact that the alpha rays usually obviated by screening are very important in the treatment of the superficial lesions and total radiation should be used.

In the course of discussion which follows the authors' paper Dr. Belot remarks that similar results have been obtained by soft x-ray radiation.

A. M. Pfeffer, M. D.

Niche Formation and Pyloric Stenosis in a Case of Gastric Lymphogranulomatosis. Dr. Paul Kaznelson. Wiener Arch. f. Inn. Med. 7:117-122, January 1923.

THE author calls attention to the fact that usually the appearance of a niche considered one of the pathognomonic roentgenological signs for ulcer, is yet not absolute. That with greater experience comes the recognition that there are some other pathological processes which may produce a niche. He alludes to Carman's warning that the niche could not assure an etiological diagnosis.

The author's case was a man, 58, who developed gastric symptoms of pain with occasional diarrhoea. Despite treatment the condition grew gradually worse, with loss of weight, and later on rise in temperature.

General physical examination gave no particular data. Gastric contents showed an HCl of 19, combined acids 44, some gastric stasis. Feces showed occult blood on a meat free diet.

Roentgenological Findings: Much gas in the region of the hepatic flexure so that the spleen was well outlined. Little residue in stomach after five hours. Vivid peristalsis and antiperistalsis in the region of the pylorus. The lumen of the pylorus is somewhat eccentrically placed and prolonged. A button form projection is seen on the lesser curvature near pyloric end of the stomach. The duodenal cap is somewhat smaller in size but regular in contour. The film confirms the fluoroscopic findings of a niche. These findings led to the diagnosis of gastric ulcer.

The striking feature, however, was that in a re-examination eight days later, the shadow of the niche was definitely broader, which led to the suspicion of the malignant nature of the case, and, therefore, operation was recommended.

The operation was performed under difficulties due to the poor condition of the patient's general health. It revealed no tumor mass, yet a generalized, circular infiltration of the pylorus, with some enlargement of the mesentery glands. No perigastritis. A posterior gastroenterostomy was performed. The patient died a few days later. Autopsoy findings revealed a number of ulcerations in the mucosa of the stomach, with sharp edges. The histological findings were those of lymphogranulomatous tissues.

Lymphogranulomatosis of the gastro-intestinal canal is of rare occurrence. There are hardly more than ten cases described in the literature. Microscopically the stomach ulcerations of lymphogranulomatous origin are about the same as the ulcus simplex. They show a deep crater surrounded with rigid thickly infiltrated edges which can very easily give the roentgenological appearance of an ulcer. These lesions, however, progress rapidly in contrast with the eminently chronic nature of the simple ulcer, so that in a few days the lymphogranulomatous ulcer is changed in appearance. This change in appearance of the niche is very often found in any malignant niche formation.

It is of course impossible to make a definite diagnosis in such cases, and in every presentation of ulcer signs a consideration of clinical symptoms should be resorted to.

A. M. Pfeffer, M. D.

The Generalized Type of Ostitis Fibrosa Cystica—Von Recklinghausen's Disease. C. P. Harris, M. D., Am. J. Roentgenol 11:146-155, February 1924.

GENERALIZED ostitis fibrosa cystica is classified as a benign fibrocystic bone disease of rare occurrence. Its etiology and pathogenesis are unknown. It has the following characteristics: (a) insidious onset, perhaps slight subjective symptoms, usually occur during the epiphyseal age period; (b) involves all bony structures but epiphyses and periosteum are not primarily involved; (c) transformation of bone marrow into fibrous or osteoid tissues, decalcification of bones with cysts, giant cell tumor formations, osteomalacia or hyperostosis of the affected bones; (d) bony deformities resulting from pathological fractures, hyperostoses, bowing or softening; (e) benign in character, lesions do not metastisize and may be removed by operation; (f) spontaneous healing of cystic areas, especially where there have been fractures; (g) course is of long duration, progress slow. The roentgenographic appearance of the bones is typical.

Application of Radiant Light and Heat. Frank Thomas Woodbury, M. D., Am. J. Electroth. & Radiol. 42:12-18, January 1924.

THE paper discusses the physics of radiant light and heat for several pages. The application of facts to therapeutics is thus worded:

"Local irradiation is applicable to all localized infections of the skin and subcutaneous tissues as erysipelas, boils and carbuncles, pustular acne, eczemas, buboes, lymphangitis and to infections in semitransparent tissues to which the longer wave lengths penetrate or which are in close vascular communication with the cutaneous capillaries, as coryzas, sinusitis, otitis-media, mastoiditis when draining, and localized infections of the long bones, digits and joints.

"It is very valuable in opthalmia neonatorum, and in gonorrheal urethritis and arthritis, in infected wounds of all kinds and it has been known to favorably effect appendicitis and peritonitis. In all conditions of lowered cutaneous metabolism and sluggish circulation as keratoses, scar tissue, varicosities and varicose ulcers, x-ray dermatitis, contusions, angio-neurotic edema, Raynaud's disease and threatened gangrene it is very valuable. It assists in the repair of wounds and the viability of skin grafts with minimum of scarring.

"Its decongestive or derivative effects are at times remarkable as in sprains, incipient lung infections, headaches, neuralgias and neuritis and especially in inflammatory conditions of the spinal meninges as in acute anterior poliomyelitis where it prevents the pressure injury due to the swelling of the meninges and also restores nutrition to parlalyzed muscles." In joint injuries it relieves the pain so that further remedial measures may be applied.

Passing to the question of general irradiation, this is indicated in all cases of faulty metabolism, and in cases of deficient oxidation with formation of fibrous tissues and deposition of foreign chemicals or even mere increase of normal substances as is the case in gout, etc.

The bulb emitting the whitest light is the one that gives spectral waves of the greatest variety. This should be remembered in giving general treatment, also that long treatments are eliminative and may be exhaus-

tive while short ones are tonic and exhilirative.

Contradictions to use of conversive heat from radiant energy are: treatment of large circumscribed abscesses before drainage is established; when hemorrage is likely from the hyperemia produced as, for example, in pulmonary tuberculosis when treatment is given over the chest or soon after an operation where there has been considerable capillary bleeding; edema with heart embarrassment contra-indicates treatment by radiant heat as do skin troubles where hyperemia would aggravate; it is also contra-indicated in all asthenic and aged patients during the process of active digestion. Lamps with reflectors which bring the rays to a focus may produce dreadful burns and they should not be used, parabolic reflectors should be used instead and the source of the radiance not too near the skin. This the operator may test with his hand.

Physiotherapy of Some Intranasal Diseases. CHARLES R. BROOKE, Chief of Physiotherapy Clinic, U. S. Veterans' Bureau, New York City. Am. J. Electroth. & Radiol. 42:4-11, January 1924.

FAVORABLE results have been secured in a variety of intranasal affections which had not been relieved by serums, medicaments or operations. The effective modalities were mechanical vibration, radiant light and heat, modified diathermy, intranasal high frequency current and ultraviolet ray. No claim is made for cure in any case but prompt and adequate relief of tenacious acute and chronic nasal symptoms has been obtained in otherwise incurable conditions. Stress is laid upon technique and sequence of modalities used.

Some of the Pitfalls in the Roentgenographic Diagnosis of Colonic Lesions with Suggestions as to the Proper Method of Overcoming Them. W. H. STEWART, M. D., Am. J. Roentgenol. 11:168-171, February 1924.

IT is not true that abnormalities of the colon can always be easily recognized by the roentgen ray and that they do not require the attention given the upper portion of the tract. The common errors met with in roentgen diagnosis of the colonic pathology are: (1) neglect to make preliminary examination before the barium enema fills the colon; (2) difficulty in distinguishing spasm from true pathology; (3) overshadowing of a lesion between haustral contractions by a distended colon; (4) filling defects caused by intestinal contents; (5) variance in findings at different stages of filling; (6) overlooking the pathology because of extreme mobility of lesion; (7) overshadowing by the barium enema of a lesion within the lumen of the colon which has produced no deformity.

The roentgenologist should be familiar with the history and clinical findings of the case before he makes the roentgen examination. A mild laxative should be given the night before and one the day before, the diet should be restricted to soft and easily digested food. On the morning of examination the colon should be irrigated with warm water, repeatedly until water returns clear. Soap enemas may cause resistance and spasm. Room temperature is important, as any chill felt by the patient will result in tension unfavorable to examination. Before the opaque enema is given a preliminary roentgenogram of the abdomen is made to avoid any error of the barium enema overshadowing a lesion. The opaque enema consists of four ounces of barium with 500 c. c. mucilage of acacia mixed with 500 c. c. of water. The can should be suspended not more than nine inches above the abdominal wall in order to avoid a rush of the fluid into the colon. The patient's confidence and relaxation should be secured by explaining to him just what is to be done. Lubrication of the anus and rectal tube should be made, all air should be expelled from the rubber tubing before insertion and the insertion should be done under deliberate exposure, thus avoiding fumbling which to the patient's mind is indicative of lack of skill. The screen is adjusted and the enema permitted to flow gently until the ampulla is filled. If a lower bowel lesion is suspected but not found, then the can can be lowered and part of the enema allowed to flow back, the patient being assured that injection will be stopped in event of excessive pain or desire for stool. After the ampulla fills, the sigmoid will unfold and one must watch closely to catch the sudden ascension of the fluid into the descending colon. The barium flows gently now into the cecum, usually taking about five minutes and the injection is stopped the minute it is full. If during the examination there is unusual delay at one part one should wait a moment to be sure it is not due to spasm. At the same time gentle manipulation is done with the spoon and gloved hand. A mark should be made on the skin to locate any lesion discovered, the light is turned on, the tube removed and a series of roentgenographic plates quickly made, a series of films taken for verification and a pair of stereoscopic films of the entire colon made. A moderate amount of the enema should then be expelled and another series of films taken, the enema emptied completely and further films taken, ending with a final roentgenoscopic examination. If all methods fail pneumoperitoneum may then be employed.

The Use of X-Ray in Gynecology. MARY ELIZABETH HANKS, M. D., J. Iowa M. Soc. 14:45-50, February, 1924.

THE author's former prejudice against x-ray has been unsurpassed, she says, by that of any other she has ever known, and she is therefore inclined to be charitable toward the prejudiced members of the profession. Nevertheless, she says that the average general practitioner is too ill informed upon the value of radiation therapy.

The prevalent belief that the x-ray should not be applied to a uterine fibroid in the presence of complications is a fallacy which she has proved throughout seven years of experience.

The technique followed has been: Nine-inch spark-gap (120,000 volts); 7 to 12 inch distance (18 to 30 cm.); 5 ma.; filter, 5 mm. Al. with sole leather; time, 5 to 17 minutes. Crossfiring is done through ports two to four inches in diameter, the number of ports varying with the pathology under treatment. A divided dosage with lower voltage is the one favored.

The following conditions are remedied by x-ray treatment: adhesions, small ovarian cysts, nonmalignant diseases of the cervix, pruritis vulvae, dysmenorrhea, troublesome symptoms of the menopause, uterine fibroids. Many x-ray technicians and even physicians are treating for tumor without any orientation of the organs of the pelvis, and without any knowledge of the associated pathology and with no attempt at diagnosis. She says: "A definite knowledge of the actual pelvic condition before treatment, the moral stamina to refuse the unsuitable case, recorded estimates of progress during treatment, and a sort of protectorate over the case after treatment—these are the only convincing answers to our critics."

She also makes a point of the fact that there is no unanimity of opinion as to the definition of the word "cure." A "cure" should mean that the pathology under treatment is no longer demonstrable, that symptoms are absent and that health is normal.

Application of Electrotherapy in Gynecology. MARY L. ARNOLD SNOW, M. D., Am. J. Roentgenol. & Electroth. 42:1-12, January, 1924.

AMENORRHEA: This condition unless it is due to an operation, malignancy, paralysis, obstructive lesion or cyst, is relieved by the application of radiant light and heat for half an hour daily over the pelvis, anteriorly and posteriorly, and the application of the static wave current per rectum for twenty minutes daily. The rectal electrode is attached to the positive pole of the static machine, the negative side being grounded, and the spark gap three or three and one-half inches long unless the patient's tolerance otherwise limits it. Diathermy may be used instead of the radiant light and heat. It is used one hour at a toleration dose, the heat increased gradually, one metal electrode with everted edges used anteriorly over the pelvis and one used posteriorly.

Cervicitis and cervical endometritis is treated by the static wave current or diathermy per rectum with the metal electrode, or per vagina. The glass vacuum tube may be used, the author says, depending upon conditions. The same modalities are used in endometritis and chronic metritis with or without the preceding use of diathermy for thermic effect; if diathermy is used 200 to 400 ma. are employed. Diathermy and the x-ray are used in malignant and infectious cases. For specific vaginitis and endometritis Dr. Pedersen's carbon electrode is used from the negative pole of the constant current to ionize iodine and thus destroy bacteria.

Dysmenorrhea associated with retroversion of the uterus "is successfully treated in all cases not due to an incurable, irremovable, strictly surgically remedial cause, or appendicitis. Treatment is given with the static wave current per rectum with a metal electrode for twenty minutes daily for one month between periods, and every other day for a period of eighteen days the next month after which daily treatments follow for ten days, until the period returns." If the flow is scanty radiant light and heat are applied over abdomen and back for twenty minutes preceding static treatment. If flow is prolonged the x-ray is used three times weekly with 5 inch spark gap, 2 ma. current, 2 mm. Al, fifteen minutes, two exposures each time, one anteriorly and one posteriorly. This is followed for "a short period of time."

Vaginismus: Here no treatment equals the use of the glass vacuum tube attached to the positive pole of the static machine, the negative pole being grounded, the spark gap not over three inches, time twenty minutes. A small electrode must be used at first, later on a large sized vaginal electrode can be used.

Associated intestinal and gastric ptosis is best treated by the sinusoidal current or wave generator current applied by pads anteriorly and posteriorly over the abdomen and back.

Urethral caruncles and hemorrhoids are best treated by the desiccation method of Dr. Clark.

Spasmodic stricture of the anus may be overcome by the use of mechanical vibration with the rectal vibratode or the conical one, using moderate speed and full stroke for five minutes daily, or the static wave current per rectum may be employed.

Subinvolution is treated by the use of the static wave current per rectum as heretofore noted, the glass vacuum tube per vagina for fifteen to twenty minutes daily, the electrode attached to the positive pole, the negative grounded, spark gap not over three inches.

Uterine fibroids unless pedunculated, submucous or polypous or associated with acute incarceration of the bladder, or the demand for immediate surgical interference are best treated with the x-ray or with radium and x-ray. Electrotherapy is not a substitute for surgery or drug therapy but there are cases where surgery can do great harm physically and mentally and where electrotherapy is the better method.

Hemorrhage when associated with a fibroid as a local cause is as a rule controled by the x-ray. In some cases the static wave current per rectum has been employed together with the x-ray with good results.

Acute Mastoiditis—Its Prevention and Treatment. CHARLES B. TAYLOR, M. D., F. A. C. S., J. Iowa M. Soc. 14:50-53, February, 1924.

DIAGNOSIS by means of the x-ray is upheld by this author who says this regarding it: "At this point I want to emphasize the value of the x-ray in all adult cases—or in all cases where the mastoid is fully developed.

"It is almost universal that if in the development of the mastoids any one of the three types—sclerotic, diploic or pneumatic—obtains on one side it will obtain also on the opposite side.

"In our history getting it will be well to learn if there has been an old mastoid involvement in either side which might have left an eburnated bone that might be confused with a normal sclerotic type. This must necessarily be taken into consideration in a comparison of the two sides.

"But in case there has never been an involvement of either side and we have one side now acute and are suspicious of a decided involvement of the cells—and x-ray of both mastoids, carefully read and compared, will tell in almost every instance, the degree of involvement. This is denied by many, but I believe that the fault lies either with the pictures or with the readings.

"The readings are not so satisfactory in the sclerotic as in the diploic and pneumatic types. This is self-evident as in case both mastoids are normally heavy an infection will not much increase their density. But it is seldom that the bones are normally so dense throughout that an involvement with pus and its concomitant destructive processes will not manifest itself in a changed picture.

"Sometimes the major portion of the mastoid is sclerotic or diploic but a large tip cell is present. Now, strange to say, if a large tip cell is present on one side it will most likely be present on the opposite side. An x-ray shows the suspicious side dark at the tip, while the well side shows a large pneumatic cell. I had a case not long since which illustrated this perfectly and at operation was shown to be exactly as read.

"I am for the x-ray and believe that the more we study it the less we will condemn it.

"Schumacher says: 'In roentgenologic examination of first degree mastoids—the cell outline is diffuse and hazy. In second degree mastoiditis, the haziness of the cell outline is increased and extends over the entire area. There is usually some point in the posterior superior angle of the temporal bone or in the body of the process where the outline is lost completely. When destruction of the cell outline becomes general, as is the case when the mastoid has begun to break down, the process is said to have reached the third degree.

During either of the later stages the inner cortex may become eroded, with abscess formation about the lateral sinus.' "

Hinemann, in writing of work based on 190 bilateral views of all possible pathological conditions selected from material collected at the Duesseldorf Ear Clinic since 1912 says: "The roentgen ray findings are compared with clinical history in each case. The different processes and stages in inflammation of the mastoid are portrayed in a characteristic manner in the roentgenogram. * * More important is the information gained from the roentgenogram as to the indications for operation, and the time at which operation should be performed. The solution of this question lies in the confirmation of the breaking down, which is the turning point in the course of an acute inflammation and can be clearly demonstrated in the roentgenogram. Therefore, a roentgenologic examination should be made routinely before opening a mastoid, and the decision as to operation should be based chiefly on the roentgen ray findings." Hinemann uses Winkler's oblique exposure altogether.

The author continues, saying: "It has only been a short time that my clinical symptoms were so positive that I unhesitatingly made the diagnosis of mastoiditis. The x-ray did not show cells broken down but there was cloudiness of the mastoid area. A wide myringotomy had been made two days earlier and yet the temperature persisted—ranging as high as 103—ear was discharging at a fierce rate; tenderness persisted over mastoid and some swelling. Operation revealed hemorrhage into all the cells but only one small cell and that near the antrum that had any pus in it. Culture showed diplostreptococcus.

"I would not advise that we abandon all clinical symptoms and rely upon x-ray exclusively any more than I would advise that the general surgeon abandon all clinical symptoms and rely upon blood count in case of some abdominal disturbance, in either case the surgeon so doing would need a referee; but I do insist that x-ray in conjunction with clinical symptoms is of supreme importance in all mastoid diagnoses."

On the Employment of Radio-Active Matter in Solution: With a Special View to the use of Alpha Rays in Treatment of the Skin. SVEND LONHOLT, M. D., Acta Radiol. 2:437-460, December, 1923.

RADIUM is too expensive and its period of disintegration is too long to make its use in skin treatments desirable. Experimental work done with thorium-X, a fifth body found in the transmutation of radiothorium is discussed here. Thorium-X is easily isolated and can be dissolved in water as well as in alcohol. "Its place in the thorium series corresponds to radium in the radium series, but it is more active as it has a much shorter halving time, and as it is succeeded by a whole series of quickly disappearing disintegration products, which are also extremely active. Hereby, many, and to some extent fairly deep-reaching, alpha rays are developed." Therefore thorium-X produces a powerful alpha ray effect in a short time. In Germany the wholesale production of thorium-X has been begun and it is sold in two forms, an ointment or dissolved in propyl alcohol, varying in strength from 500 to 6000 E. S. E. per c. c. German reports are not very detailed and are rather optimistic. In most skin diseases results have been decidedly inferior but in psoriasis and in lupus erythematodes the results reported are remarkable. The Finsen Light Institute has carried out a series of preliminary experiments. The anatomo-pathological changes very much resemble the changes produced by roentgen rays. Thorium treatment is easy, clean, agreeable to use and entails no risk of deep burns or delayed harmful after effects.

Radium Treatment of Cancer of the Lip. H. LAMMERS, M. D., Acta, Radiol. 2:497-507, December 1923.

IN 1922 the author obtained the clinical cure of ten cases of cancer of the lip by the use of radium alone. A review of all cases treated at his institute from September 1915 to September 1923 shows 47 cases in all. All were treated exclusively with radium and show the following results: 39 cures; 7 cases grew worse and terminated fatally. In September 35 patients were still entirely immune, the other four have been lost sight of. Pure gamma rays are used with an applicator of plastic material within which is the radioactive sources in a metal filter and a plate of lead to protect the other lip. The apparatus is painful and tiresome to hold and morphine is injected to make the treatment bearable. The cosmetic local result is brilliant and the amelioration of the patients' general condition is most remarkable.

Roentgenological Synopsis of Pulmonary Tuberculosis with Special Reference to the Diagnosis of Cavitation. P. RAMOS-CASELLAS, M. D., Southwestern Med. 8:114-127, March 1924.

THE paper gives a detailed discussion of the interpretation of roentgen pictures in the following: miliary tuberculosis; chronic ulcerative tuberculosis; cavitation, acute and chronic; fibroid phthisis; glandular or hilus tuberculosis; tubercular pleurisies; empyema of pulmonary tuberculosis.

In the general discussion preceding the specific discussion he says that the chief value of roentgenography in pulmonary tuberculosis is prognostic, rather than diagnostic, not that it is lacking in diagnostic value but that this is secondary. There are non-tuberculous lesions which cast shadows similar to those of tuberculosis and hence the closest cooperation is necessary between clinician and roentgenologist. These two should never disagree if they will only set aside personalism and coolly and conscientiously acknowledge the information at hand.

Roentgen signs, at times, appear much earlier than the physical signs.

"If the exactness of the size of a pulmonary lesion, its accurate location, the true condition of the pulmonary parenchyma and the pleura, the degrees of pulmonary function in reference to the degree and character of the infection, the presence of excavation etc., could be determined in a true fashion by physical examination alone, the science of roentgenology, in so far as pulmonary tuberculosis is concerned, would be dealt a severe blow, for here is where the x-ray examination shines with unique brilliancy. Very early as well as very old lesions may give indefinite physical signs, yet both are of greatest concern to the clinician; the former in establishing a diagnosis, the latter in determining the extent of the pulmonary involvement and the amount of individual resistance. In advanced tuberculosis, the clinician is surely remiss if he fails to avail himself of the aid of roentgenology. In cavitation, for instance, there is no marked variation in the physical signs from the moment excavation is established until healing takes place and the cavity is walled off. How then is he to arrive at prognostic criteria. The same holds true of other phases of pulmonary tuberculous pathology. Again, can he, the clinician, determine by physical examination and in an accurate manner the amount and kind of fibroid

proliferation and the stage of the healing process?

"A combined skiagraphic and fluoroscopic study is a necessity in certain types of cases for the study of shadows alone will not determine how the lungs are performing their mechanical and physiological task. Whether or not the diaphragmatic excursion is within normal limits; the extent and cause of limited pulmonary excursions; the influence that extensive changes in the mesial pleura or marked fibrosis along the descending bronchial trunks may have in circulatory disturbance; and if displacement and even distortion of a thoracic organ is momentary or permanent.

"Farther on he says: In order to fully comprehend the meaning of the different shadows, the physician should be well acquainted, first with the degree of x-ray absorption of a given tissue, second, with the pathological changes possible in the organ to be examined; and last, but not least, with the anatomy and physiology of the organs shown on the skiagram. Gas, fat, muscles, fibroid tissue, bones and fluid, all have different degrees of power of x-ray absorption, according to their atomic weights, gas the least, fluid the most, so that if we could take different layers of equal thickness of the above mentioned elements and an equal x-ray exposure be given, the x-ray plate would reveal a gradual increase in density from the gas to the fluid.

"There is no such thing as typical, normal chest radiogram. The normality, however, can be established at the moment a plate is studied, always taking into consideration the age, occupation, degree of chest muscular development and previous pulmonary diseases of the patient. Let us not forget previous pulmonary diseases! Once that the normal shadows have been observed and their meaning understood, then one can conceive the variations from a physiological into a pathological state. No matter what pathological condition we may choose, it is impossible to give an equal description of the same in all cases, for the reason that no two lesions are, histopathologically speaking, alike * * * Flat plates should be used only when and where steroscopic plates are not feasible. Stereoscopic plates have the advantage that they indicate the location and the depth of the pulmonary lesion".

Cancer Therapy From the Surgeon's Standpoint. EMIL G. BECK, M. D., F. A. C. S., Am. J. Roentgenol. 11:117-137, February 1924.

TOO many cases are regarded as hopeless before all possibilities have been exhausted. At the present time the surgeon and the radiologist dominate the cancer therapy field. The author says it is his belief that the time is coming when immunizing serums may take the place of other forms of treatment. However this may be, the surgeon's attitude toward the value of radiology has changed in the last few years, although there is still room for much greater cooperation between surgeon and radiologist.

Superficial tumors and other growths respond quickly to radiation because it is possible to apply the radioactive substance directly to the growth. The same advantage can be secured in deep therapy by surgical removal of the overlying tissues and as much of the tumor as is possible and then introducing the radioactive substance directly into the tumor mass. This is the author's practice. General infection and toxemia is thus avoided, also the absorption of the rays by surrounding tissues is avoided and all the rays of the radium are utilized. "Such surgical procedures must often of necessity be very extensive and, therefore, must be attended with some risk. A halfway procedure is useless in such cases. It is a surprise to us, however, to find that the immediate mortality was not so large as one would expect. It is not necessary to describe the technique, because this varies in each case * * * If the principle appeals to the trained surgeon he will be able to devise his own plan in each case. The principle of surgical procedure is as follows. We remove the skin and fat, the muscles and other overlying tissues, and as much of the growth as is safe or possible.

"At times it is possible to remove the tumor entirely, leaving a perfectly clean field with no visible remnants of the growth. At other times it is possible to remove only a part of the growth, because it is attached to or imbedded in vital organs. No attempt should be made to diminish the size of the wound by sutures. The wound is left open for subsequent applications of either roentgen ray or radium, as the case may require * * * * Screening becomes necessary only when we have exposed large blood vessels, vital organs or nerves. These must be protected during radiation. The dosage of radiation employed may now be reduced to a fraction of the quantity which would have been required had the application been made through the skin, for reasons already mentioned."

He adds a warning that the application of these methods must be done in a logical manner, else harm may be done. They may destroy the growth, arrest or sterilize it or accelerate it.

"A statistical report of our work is not available at present, neither is it advisable, because the majority of cases treated by the method here advocated dates back only about one or two years. We have in our series of over 200 cases, some of which have stood a long test, one being fourteen years, another nine years without recurrence. We fully realize that a great deal can be accomplished with the roentgen rays and radium alone, without the aid of surgery, and we do not subject every case to surgical operation. But we are trying to make a comparative study as to whether surgery combined with radiotherapy will accomplish more than either of them alone. Our results have not always been satisfactory, but we are not discouraged, for the class of cases in which this apparently radical treatment is employed has very little to lose, and we are convinced that we have benefited a few and harmed none."

Several case reports are given, one a very remarkable one of carcinoma of the breast and hip. In this case the ramus of the pubis had been destroyed by the growth. After a series of deep therapy the restoration of this ramus was complete and the patient walked without any limp. At the present time, a year after treatment was begun, there is no recurrence.

The Present Status of Radiation Therapy in Cancer. ARTHUR U. DESJARDINS, M. D., Journal-Lancet, 44:103-109, Feb. 15, 1924.

ABOUT 90 per cent of basal-cell carcinoma and epithelioma can be permanently cured by radiation therapy, but the opposite is true of squamous-cell carcinoma.

The action of radiation on any type of cell depends on the dosage and may be destructive, inhibitory or may have no effect.

The fear of stimulating the growth of cancer cells has been greatly over exaggerated. This fear grew out of the results of experimental work with tissue cells, developing eggs, plants and seeds which do reveal a stimulating effect but the effect is almost invariably temporary and the normal metabolic rate of the cells is soon

restored, or if not, retardation ensues or even ultimate destruction of the growth.

There is no essential difference in the action of x-rays on cells, although in certain lesions the use of one or the other agent is preferable, depending upon the nature, size and location of the lesion and on the available form of the agents themselves. In many cases of cancer both agents should be combined.

The practice of using the bare seeds of radium emanation has its dangers, one of which is that the glass segments remaining in the tissues have the potentialities of foreign bodies, a danger which cannot be disregarded, but of greater importance than this is the fact that such units allow all of the beta and gamma rays to pass out into the surrounding tissues. These rays have a marked caustic effect, leading to necrosis and sloughing. Steel needles, although to a lesser degree, have the same disadvantage.

As to surgery and radiation he says: "The surgeon who is content to save only one of five cases of cancer of the breast, and is unwilling to try supplementary radiation, or insists on operation in cases of carcinoma of the cervix when equally good results would be obtainable by radiation alone, may be left to his fate; the same is true of the radiologist who does not recognize his limitations."

The treatment of cancer of the rectum at the Institute of Radium in Brussels is cited to illustrate perfect cooperation between radiologist and surgeon.

In the newer deep therapy, radicalism is rapidly giving away to rationalism. It is doubtless true that more or less marked improvement can now be attained in cases which heretofore showed little response to the old methods but the exact limits of deep therapy have not been established, and to regard it as a cure-all is folly. Used intelligently it is a means of relieving suffering and prolonging life.

In cancer of the breast the informed surgeon will operate in only those cases in which there is likelihood of the complete excision of the growth, that is, where this seems clinically unquestionable. Of course there is need at times for palliative excision and it is also possible that inferior radiology may mar the effect of superior surgery almost as much as injudicious surgery may spoil effective radiologic precedure. The author believes in preliminary roentgen treatment of the lymphatic areas as well as the involved region, and treatment should be repeated after operation, at least once or twice, depending upon the decree of glandular involvement. One or two weeks should elapse between the preliminary roentgen treatment and operation, this to allow for sufficient cellular changes to minimize the possibility of surgical dissemination. There will be no interference with wound healing unless the dosage is carried to extreme limits. Surgeons who have thoroughly tested the method advocate its use. "In the inoperable and borderline cases, thorough radiation treatment may so improve the condition that surgical amputation as a palliative measure seems feasible from a strictly technical standpoint, but from the standpoint of the patient's welfare the effect of such a measure is often pernicious; it apparently opens up to the remaining cancer cells fresh avenues of activity and the effect is like that produced by touching a match to a mound of dry leaves. Therefore when radiation has produced relatively satisfactory improvement, palliative operation should not be undertaken lightly in case of cancer of the breast or other malignant tumors. In some of the inoperable and recurrent cases radium can be effectively combined with the x-rays, and its use in suitable cases should not be neglected.

In cancer of the uterus, if limited to the fundus, hysterectomy is the choice because the application of radium here is somewhat uncertain—it cannot be placed with exact reference to the lesion. Whether radium or surgery is used preroentgenization is advised and if radium is used then it should be supplemented by x-rays. When the malignancy involves the cervix surgery cannot compete with radiation treatment in any but the early cancer, and even here radiation is a worthy competitor of surgery. It is necessary to supplement radium therapy by x-ray treatment as the maximum effectiveness of radium is restricted to a zone about 1.5 to 2.0 cm. around the agent. The fact that few cases are cured is not an argument against the treatment since the "radiologist is too often regarded as a pathologic junk dealer."

In lymphoblastoma, radiation by x-rays and radium is the only form of treatment that exerts any noteworthy influence on these morbid states. Many patients are completely restored to health but others are only partially improved. Improvement, however, is not permanent and recurrence sooner or later is inevitable. "In cases of Hodgkin's disease and lymphosarcoma, the average duration of the disease from the onset of symptoms, without systematic treatment, is approximately two and one-half years. While we are not yet in a position to assert that radiation actually prolonges life, it may be asserted positively that radiotherapy is a means of relieving symptoms more or less completely, for a long time, and of making the life period of such patients infinitely more comfortable. In the treatment of these conditions, radium plays a relatively minor part. It is useful in dealing with the large cervical and axillary adenopathy so often encountered because the action of radium on such adenopathy is generally more rapid than that of the x-rays. But to combat deep adenopathy, mediastinal or abdominal, x-rays are more effective. In fact, to obtain the best results, treatment should not be confined to the superficial and palpably enlarged glands, but should be more or less routinely directed to all the important lympathic channels; cervical, axillary, mediastinal, abdominal and inguinal. This is best accomplished by combining the two agents as previously indicated."

Problem of Deep Therapy. GUSTAV BUCKY, M. D., Am. J. Roentgenol. 11:137-139, February 1924.

Conclusions: (1) "The right to establish a standard tissue dose or organ dose (so-called mathematical or physical dose) applicable in every case is decidedly doubtful. More than that, it appears advisable to give the dose according to the appearance of the healthy cells which surround the organ to be treated. (2) Overlarge doses, even if they show only slight skin symptoms, do not seem to be advisable. Just as little is it advisable to grade the dose according to the skin appearance. (3) The use of extremely hard rays seems to be advisable. (4) During treatment much attention should be given to the general appearance and state of health. (5) Special consideration should be given to biological in addition to physical research, particularly to clear up the very important question of the connection of the wave-length with biological effect."

X-Ray and Radium Protection Committee, Revised Report. Brit. J. Radiol. 20:27-34, January 1924.

THIS is a revised addition of the Committee's report made in 1921 and contains alterations and additions to that report. Copies may be

secured from the Director of the National Physical Laboratory, Teddington, Middlesex, England.

The report is quoted below:

Report No. 1

INTRODUCTION.

The danger of over-exposure to x-rays and radium can be avoided by the provision of efficient protection and suitable working conditions.

The known effects on the operator to be guarded against are:—

1. Visible injuries to the superficial tissues, which may result in permanent damage.

2. Derangements of internal organs and changes in the blood. These are especially important, as their earlier manifestation is often unrecognized.

GENERAL RECOMMENDATIONS.

It is the duty of those in charge of x-ray and radium departments to ensure efficient protection and suitable working conditions for the *personnel*.

The following precautions are recommended:—

1. Not more than seven working hours a day.

2. Sundays and two half-days off duty each week, to be spent as much as possible out of doors.

3. An annual holiday of one month or two separate fortnights.

Sisters and nurses, employed as whole-time workers in x-ray and radium departments, should not be called upon for any other hospital service.

PROTECTIVE MEASURES.

It cannot be insisted upon too strongly that a primary precaution in all x-ray work, whether with stationary or portable sets, is to surround the x-ray bulb itself as completely as possible with adequate protective material, except for an aperture as small as possible for the work in hand.

The protective measures recommended are dealt with under the following sections.

I. X-rays for diagnostic purposes.

II. X-rays for superficial (low-voltage) therapy.

III. X-rays for deep (high-voltage) therapy.

IV. Electrical precautions in x-ray departments.

V. Ventilation of x-ray departments.

VI. X-rays for industrial and research purposes.

VII. Radium therapy.

It must be clearly understood that the protective measures recommended for these various purposes are not necessarily interchangeable; for instance, to use for deep therapy the measures intended for superficial therapy would probably subject the worker to serious injury.

It should be further pointed out that the protective values of certain materials are much affected by a change in the voltage applied to the x-ray tube. This applies particularly to materials in which lighter elements than lead furnish the chief protection. The importance of obtaining a National Physical Laboratory test in this connection is emphasised. In the case of protective slabs or plasters made up of a mixture of materials, the difficulty of securing uniform mixing should be met by a generous margin of safety in estimating the required thickness.

I. X-RAYS FOR DIAGNOSTIC PURPOSES.

1. *Screen Examinations.*

(*a*) The x-ray bulb should be enclosed as completely as possible with protective material equivalent to not less than 2 mm. of lead. The material of the diaphragm should be equivalent to not less than 3 mm. of lead. The design of the diaphragm should be such as to permit it to be completely closed. The simpler rectangular forms of diaphragm will, in general, be found preferable to the iris type.

In the case of installations which are incapable of generating peak voltages exceeding 70,000, the lead value of the tube enclosure may be reduced to 1.5 mm. and of the diaphragm to 2 mm.

(*b*) The fluorescent screen, attached as a permanent fitting to screening stands, etc., should be fitted with lead glass equivalent to not less than 2 mm. of lead. In all positions the lead glass should be large enough to cover the area irradiated when the diaphragm is opened to its widest. For screens of smaller area, the lead glass should be mounted in a frame of protective material which overlaps the screen and is of adequate width and thickness to afford protection in all positions of the screen. In the case of portable screens considerations of weight militate against the recommendation of a degree of protection greater than 1 mm. of lead. As far as possible, the glass should be of uniform thickness and free from striations and air bubbles.

(*c*) To afford protection from scattered radiation in the case of a couch, a protective screen, mounted on the carriage and of material equivalent to not less than 2 mm. of lead, should be employed between the operator and the x-ray box. In addition, a device such as a "collar" of protective material between the tube box and the underside of the couch is effective. In the case of a screening stand, an "apron" of protective material should be attached to the lower edge of the screen, and panels of protective material mounted on each side of the patient.

(*d*) Protective gloves should be of lead rubber (or the like) and afford protection for both back and front of hand (including fingers and wrist). The protective value should not be less than ½ mm. of lead. Gloves should preferably be lined with leather or other suitable material. (As practical difficulties militate at present against the recommendation of a greater degree of protection, all manipulations during screen examination should be reduced to a minimum).

(*e*) In those cases where the necessity is felt for even greater protection for the operator, goggles and aprons may advantageously be worn. The glass of the goggles should have a lead value not less than ½ mm.; aprons should have lead values not less than 1 mm.

(*f*) A minimum output of radiation should be used with the bulb as far from the screen as is consistent with the efficiency of the work in hand. Screen work should be as expeditious as possible.

2. *Radiographic Examinations* ("*overhead*" *equipment*).

(*a*) The x-ray bulb should be enclosed as completely as possible with protective material equivalent to not less than 2 mm. of lead. This figure may be reduced to 1.5 mm. in the case of installations which are incapable of generating peak voltages exceeding 70,000.

(*b*) The operator should stand behind a protective screen of material equivalent to not less than 2 mm. of lead. In general, such screens should not be less than 3 ft. 6 in. wide and 7 ft. high and should extend to within 1 in. of the ground. If a window is provided, its lead equivalent should not be less than 2 mm. Its dimensions need only rarely exceed 9 in. by 6 in.

II. X-RAYS FOR SUPERFICIAL (LOW-VOLTAGE) THERAPY.

It is difficult to define the line of demarcation between superficial and deep therapy.

For this reason it is recommended that, in the reorganization of existing, or the equipment of new, x-ray departments, small cubicles should not be adopted, but that the precautionary measures suggested for deep therapy should be followed.

The definition of superficial therapy is considered to cover sets of apparatus giving a maximum peak voltage of 100,000 (15 cm. spark gap between points; 5 cm. spark gap between spheres of diameter, 5 cm.).

Cubicle System.

Where the cubicle system is already in existence it is recommended that:—

1. The cubicle should be well lighted and ventilated, preferably provided with an exhaust electric fan in an outside wall or ventilation shaft and suitable air inlets. The controls of the x-ray apparatus should be outside the cubicle.

2. The walls of the cubicle should preferably not take the form of partitions, but should extend from floor to ceiling. If partitions are adopted, they should be not less than 9 ft. in height and extend to the floor level.

3. The walls (and where necessary, the floor and ceiling) of the cubicle should be of material equivalent to not less than 2 mm. of lead. Windows should be of high quality lead glass of equivalent thickness. They need only rarely exceed 9 in. by 6 in. in dimensions. Care should be taken that the protective material overlaps at joints.

4. The x-ray bulb should be enclosed as completely as possible with protective material equivalent to not less than 2 mm. of lead. This figure may be reduced to 1.5 mm. in the case of installations which are incapable of generating more than 70,000 volts.

III. X-RAYS FOR DEEP (HIGH-VOLTAGE) THERAPY.

This section referes to sets of apparatus giving peak voltages above 100,000.

1. Small cubicles are not recommended.

2. A large, lofty, well-ventilated and lighted room should be provided, preferably provided with an exhaust electric fan in a suitable air duct.

3. The walls (and where necessary the floor and ceiling) of the room should provide protection equivalent to not less than 3 mm. of lead. Windows should be of high quality lead glass of equivalent thickness. They need only rarely exceed 9 in. by 6 in. in dimensions. Care should be taken that the protective material overlaps at joints.

4. The x-ray bulb should be enclosed as completely as possible with protective material equivalent to not less than 3 mm. of lead.

5. A separate enclosure should be provided for the operator, situated as far as possible from the x-ray bulb. All controls should be within this enclosure, the walls and windows of which should be of material equivalent to not less than 3 mm. of lead.

IV. ELECTRICAL PRECAUTIONS IN X-RAY DEPARTMENTS.

1. Wooden, cork, lino or rubber floors should be provided; existing concrete or similar floors should be covered with one of the above materials.

2. Stout metal tubes or rods terminating in spheres should, as far as possible, be used instead of wires for conductors. Overhead conductors should not be less than 9 ft. from the floor level. The connecting leads from the overhead conductors to the x-ray tube should be brought down

in positions as remote as possible from the operator and patient. The provision of thickwalled insulating tubing to shield the more adjacent parts of the connecting leads is recommended. Thickly insulated wire is preferable to bare wire. Slack, looped or low-hanging wires should be avoided. Small spring tapes should be replaced by rheophores of robust design with heavily insulated wire.

3. All metal parts of the apparatus and room should be efficiently earthed.

4. All main and supply switches should be very accessible and distinctly indicated. It should not be possible to close them accidentally. Wherever possible double-pole switches should be used in preference to single-pole. Fuses no heavier than necessary for the purpose in hand should be used, together with quick-acting double-pole circuit breakers. The possibility of unemployed leads to the high-tension generator should be prevented by interlocking switches or the like.

5. Alternative spark gaps (preferably of the sphere type), should be provided. They should be furnished with cm. or inch scales, together with a voltage scale. The spark gaps should be situated in positions where they can easily be read and adjusted while the tube is in operation.

V. VENTILATION OF X-RAY DEPARTMENTS.

1. It is strongly recommended that the x-ray department should not be below the ground level. In general, ceilings should not be less than 11 ft. in height. The presence of steam piping and the like must be allowed for. Damp rooms should be avoided.

2. The importance of adequate ventilation in both operating and dark rooms is supreme. Artificial ventilation is recommended in most cases. With very high potentials coronal discharges are difficult to avoid, and these produce ozone and nitrous fumes, which are prejudicial to the operator. Rotating rectifiers often require the provision of a special ventilating duct or like measure. Unenclosed rectifying spark gaps are better replaced by enclosed types. If vacuum valves are used, the fact that they may produce x-rays should not be lost sight of.

All rooms, including dark-rooms, should be capable of being readily opened up to sunshine and fresh air when not in use. The walls and ceilings of all rooms, including dark-rooms are best painted some light hue.

VI. X-RAYS FOR INDUSTRIAL AND RESEARCH PURPOSES.

The preceding recommendations will probably apply to the majority of conditions under which x-rays are used for industrial and research purposes.

VII. RADIUM THERAPY.

The following protective measures are recommended for the handling of quantities of radium up to one gram:—

1. In order to avoid injuries to the fingers the radium, whether in the form of applicators of radium salt or in the form of emanation tubes, should always be manipulated with forceps (preferably wooden) or similar instruments, and it should be carried from place to place in long-handled boxes lined on all sides with 1 cm. of lead.

2. In order to avoid the penetrating rays of radium all manipulations should be carried out as rapidly as possible, and the operator should not remain in the vicinity of the radium for longer than is necessary.

The radium when not in use should be stored in an enclosure, the wall thickness of which should be equivalent to not less than 8 cm. of lead.

3. The handling of emanation should, as far as possible, be carried out during its relatively inactive state. In manipulations where emanation is likely to come into direct contact with the fingers thin rubber gloves should be worn. The escape of emanation should be very carefully guarded against, and the room in which it is prepared should be provided with an exhaust electric fan.

GENERAL.

The governing bodies of many institutions where radiological work is carried on may wish to have further guarantees of the general safety of the conditions under which their personnel work.

1. Although the Committee believe that an adequate degree of safety would result if the recommendations now put forward were acted upon, they would point out that this is entirely dependent upon the loyal co-operation of the personnel in following the precautionary measures outlined for their benefit.

2. The Committee would aslo point out that the National Physical Laboratory, Teddington, is prepared to carry out the exact measurements upon x-ray protective materials and to arrange for periodic inspection of existing installations on the lines of present recommendations. (See Report No. 2).

3. Further, in view of the varying susceptibilities of workers to radiation, the Committee recommend that wherever possible periodic tests, *e.g.*, every three months, be made upon the blood of the personnel, so that any changes which occur may be recognized at an early stage. In the present state of our knowledge it is difficult to decide when small variations from the normal blood-count become significant.

REPORT NO. 2.

In view of the widespread uncertainty and anxiety as to the efficacy of the various devices and materials employed for the purposes of protection against x-rays, the X-ray and Radium Protection Committee strongly advise that the heads of x-ray departments of hospitals and other institutions should safeguard themselves and their staff on this score by recommending to the hospital authorities the adoption of the following precautions:—

1. The various protective appliances should be inspected and reported on by the National Physical Laboratory (N. P. L.) Teddington. In the event of an adverse report, early steps should be taken to carry out the recommendations of the Laboratory. The Laboratory is prepared, wherever possible or expedient, to engrave (or otherwise suitably mark) the N. P. L. monogram and year of test on such appliances as provide the full measure of protection laid down in the Revised Report No. 1 of the Protection Committee. It should be pointed out that, in the case of materials which may deteriorate, *e.g.*, lead rubber, such inspection should be periodic, say, every twelve months.

2. Within the Committee's recent experience, the working conditions of x-ray departments, *e.g.*, lay-out of installations, degree of scattered radiation, ventilation, high-tension insulation, etc., are often unsatisfactory. It is recommended that such conditions be inspected by the N. P. L. and that early steps be taken to give effect to such alterations as may arise out of their report. It is advised that, in the planning of new radiological departments, advantage be taken of the facilities available at the N. P. L.

3. Manufacturers of x-ray apparatus are also invited to assist in reassuring the public by actively co-operating with the Committee in its recommendations. It is suggested that protective materials or equipment should not be sold or incorporated into an installation unless accompanied by a specification based upon an N. P. L. certificate or report stating, in terms of the equivalent thickness of lead, the degree of protection afforded.

In the interest of both the trade and profession, it is urged that manufacturers should put themselves into a position to be able to guarantee that their apparatus complies with the recommendations of the Committee.

4. The Committee recommend that the various instruments dealing with the measurement of current (ammeters and milliammeters) and voltage, be standardized by the N. P. L. With reference to the measurement of secondary voltage, the the Committee recommend that every installation should be provided with adequate means for enabling this to be easily effected, *e.g.*, by kilovoltmeter, sphere-gap voltmeter or the like.

5. The Committee would further urge that heads of x-ray departments should insist upon complete N. P. L. inspection of imported materials and apparatus.

Studies on the Relation Between Tumor Susceptibility and Heredity. CLARA J. LYNCH, Ph. D., J. Exper. Med. 39:489-495, March 1924.

THIS is a preliminary report presenting results obtained from crossing female mice from tumor strains with males from other strains. The resulting tumor incidence in the inbred and backcross daughters supports the theory that the tendency to develop neoplasms is hereditary. The frequency with which tumors appear in the first filial generation in such crosses indicates that the character is dominant.

The Basis in Experimental Pathology for Radium Therapy of Malignant Disease. R. HUGHES PARRY, M. B., B. S., British J. Radiol. 29:3-16, January 1924.

DURING the last quarter of a century experimental research has established a firm basis for radium therapy, although not all that was hoped for has been accomplished. This article reviews the work of many radiologist and other research workers.

"The degree of irradiation to which malignant tissue should be exposed in order to induce increased resistance lies within narrow limits, and it may be that the clinical successes in the treatment of malignant disease by means of radium imply that in them the dose of irradiation necessary to produce active immunity has been given. On the other hand, cases in which such an insufficiency of irradiation has been applied that the altered cancer cells have led to a definite sensitization of the patient must, naturally, terminate in disaster.

"When considered from the point of view of practical application in

treatment, both radium and x-rays have their advantages and disadvantages * * * Up to the present radium has been tried mainly in the cases of inoperable malignant diseases, and then often with markedly encouraging results.

"Too much stress cannot be laid upon dosage where treatment with radium is concerned. To obtain the optimum result there exists, no doubt, an optimum dosage, so that growth of the neoplastic cells, but not their power for inducing active immunity, is destroyed, whilst at the same time the resulting damage to the host is a minimum. This dosage, as determined by time, quantity and mode of application, varies for different tumors and even for similar tumors under different conditions and in different localities. Radium is a more delicate instrument than the knife, and not less potent for good or ill."

The Alleged Biologic Radioactivity of Potassium Salts. Editorial, Jour. A. M. A., 82:720, March 1, 1924.

THE work of Zwaardemaker of Utrecht has shown that "among the elements sodium, calcium and potassium, the ions of which enter into the Ringer solution or its various more modern applications, potassium alone is radioactive; indeed, it is the only radioactive element in the body. The substitution of various other radioactive elements, such as uranium, thorium and radium, in equiradioactive proportions for potassium, permits the functions protected by Ringer's solution to proceed as usual, whereas in their absence they soon cease. * * * The cogency of Zwaardemaker's statements has been shattered however, by several biologists, most recently by another Dutch investigator, the physiologist, Hamburger of Groningen. He has shown that potassium is not needed in Ringer's solution, provided the other ions are properly balanced; that is, if the quantitative adjustments between the physiologically antagonistic calcium and sodium ions are properly made. The radioactive factor thus is eliminated, and with it all justification for unsubstantiated hypotheses in a field that easily lends itself to quackery."

Methods of Improving the External Application of Radium for Deep Therapy. WILHELM STENSTROM, Ph. D., Am. J. Roentgenol. 11:176-186, February 1924.

RADIOTHERAPY is a failure when it is misused but when rightly used it is a success. Knowledge of how to use it is absolutely an essential. Too many patients are treated with radiation when it is not indicated and often when it is indicated it is applied in a wrong way. "Poor applicators used for radiation are worse than dull knives used for operations." Carefully constructed applicators will do away with some of the disadvantages of radium and an improved pack is here discussed with illustrations to show its construction and to show how the radiation is distributed. The most important advantage it has over the old pack is that the total amount of radiation absorbed by the body is only about twice the amount absorbed directly under the field, while with the old type pack the amount absorbed by the whole body is many times that absorbed directly under the field.

Pleuritis Mediastinalis. J. B. POLAK, M. D., Acta. Radiol. 2:461-467, December 1923.

THE different localities where encapsulated exudates of the mediastinal pleura may occur is discussed and a report is given of a case of mediastinal seropneumothorax which occurred in a woman 58 years of age who from her twentieth year had suffered from gall stones and had had three operations for this. The roentgen examination showed a triangular shadow behind the heart, the shadow having a clear portion at its base and disappearing after about 100 c. c. of air had been aspired by puncture. The author has found no such case in the literature, where there has been only a posterior mediastinal pleurisy.

Osseous Development in Endocrine Disorders. WM. ENGELBACH, M. D., and ALPHONSO MCMAHON, M. D., Endocrinology 8:1-58, January 1924.

FROM the general diagnostic information which the writers have derived from the roentgenological comparison of endocrinopathic and normal subjects the writers believe that the radiological signs offer the prospect of being more valuable than are the basal metabolism, blood chemistry and other determinations.

"Retardation of development of all the bones of the osseous system, not only of the carpals, in uncomplicated hypothyroidism can be demonstrated roentgenologically in all ages up to that of completion of normal skeletal growth. This will be an additional aid to diagnosis in those cases already beyond the age of normal carpal development upon which basis hitherto has depended the roentgen picture of osseous change indicative of hypothyroidism.

"Hypogonadism and eunuchoidism have consistently shown a definite late fusion of the epiphyseal ends of the long bones. While this has been suspected clinically, we are unacquainted with any definite reontgenological demonstration of these abnormalities in secondary hypogonadism. The late closure of the epiphyseal ends in the presence of an active hormone from the anterior lobe of the hypophysis explains the overgrowth of the long bones in these subjects.

"In anterior lobe pituitary insufficiency in which there is a primary deficiency of the anterior lobe and a secondary deficiency of the generative organs, there has been found uniformly present a late closure of the epiphyseal ends of the long bones associated with undergrowth of these bones. The reason for the undergrowth of the long bones in the presence of the open epiphyseal ends in this disorder is the absence of the hormone from the anterior lobe of the hypophysis.

"In the pluriglandular syndrome the development of the osseous system as demonstrated roentgenologically is very difficult to interpret. From the studies of our cases thus far we are of the impression that the following facts obtain: (a) in the thyropituitary disorder there is an advance of the carpal and long bone nuclei development over that of pure hypothyroidism unassociated with pituitary disorder. (b) In pituitary thyroidism there is a retardation of the appearance of the osseous nuclei, as well as of the fusion of the epiphyseal ends of the long bones, more marked than that in pure hypothyroidism or in the normal. (c) The markedly heterogeneous pictures presented in the multiglandular syndromes will depend upon the sequence in which the various disorders were superimposed upon each other. For this reason the combination of the same glandular disorders might present entirely different radiographic pictures of the osseous development at the same age, depending upon the order in which the various glands might have become involved.

"In the less frequent but very instructive condition if pubertas praecox (suspected pinealism), the most unusual advancement in development of the bone nuclei and early fusion of the epiphysical lines was found. The four cases studied confirmed our earlier belief relative to the effect of gonad hormone upon the osseous

growth and development, and were a convincing confirmation of the exactly opposite picture consistenly present in the hypogonad.

"Thymo-lymphatism in the few cases studied apparently presented much the same osseous retardation as mild hypothyroidism. The osseous development in positive cases of enlarged thymus should be more thoroughly studied, with the view of clearing up this much mooted point of the relation of thymus function to osseous development."

The Diagnosis and Treatment of Enlarged Thymus. G. W. GRIER, M. D., Am. J. Roentgenol. 11:141-144, February, 1924.

ONE should be on the alert for enlarged thymus in young infants, especially in those of premature birth. Heavy breathing, a crowing inspiration and later on a failure to thrive should direct suspicion to this condition. It should be remembered that the thymus enlarges greatly when the baby cries.

Radium treatment is practically a specific. The dosage required to produce a favorable result is not large and the author says that the thymus can be sufficiently reduced without producing an erythema of the skin. There are many minor differences in technique which do not materially alter the final result, but if one follows a prescribed technique he should adhere to it strictly. The main factors governing dosage are the quantity of radium used, its distribution, whether in one or several capsules, the distance from the skin and the number of areas treated.

"One hundred milligrams of radium in one capsule and moved about over different areas has a different effect from the same quantity divided into four capsules of 25 mg. each and scattered about over one area, even if the same distance from the skin and the same number of milligram hours are used. It should be remembered that where adjoining areas are exposed, such area receives a part of the dose when the adjacent area is exposed. In an ordinary sized area of about one by two inches this extra dosage amounts to about one-quarter of the dose applied to each area, so that if other adjoining areas are treated, each area receives exactly twice the dose directly applied to it. The technique which I have used satisfactorily for some time is to place four tubes of radium, each containing 25 mg., in a wooden block with holes bored in it one inch apart to contain the capsules. The filter used is one millimeter of brass. The block is left in position for ten hours with the radium at a distance of three-fourths of an inch from the skin. This dose does not produce any erythema, and usually one treatment is all that is necessary, although occasionally it has to be repeated. It is an entirely safe dose and an be increased to twelve or fourteen hours if desired, although I have not considered it necessary."